

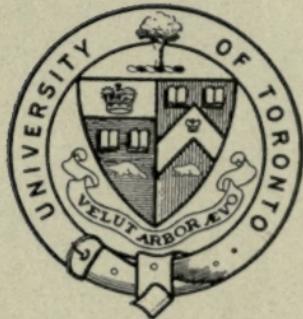
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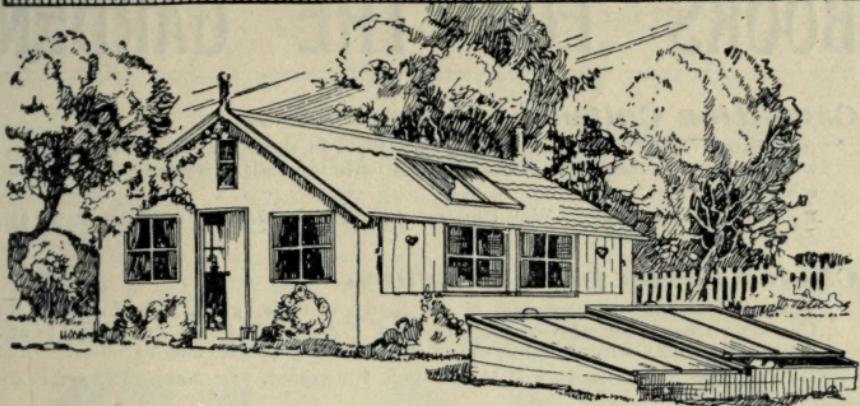
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PLANT PROPAGATION





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PLANT PROPAGATION

PLANT PROPAGATION

BEING A DESCRIPTION OF THE VARIOUS
METHODS EMPLOYED BY BOTH AMATEUR
AND PROFESSIONAL GARDENERS

WRITTEN AND COMPILED BY
WALTER DAVIS

EDITED BY
W. D. DRURY, F.R.H.S.

ILLUSTRATED

LONDON

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1922

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FOREWORD

PLANT propagation is of the greatest utility to mankind, so much do we rely on the Vegetable Kingdom for our sustenance, clothing, furniture—absolute needs, in fact, to say nothing of our luxuries. Further, it is of special interest to those fond of the healthy pursuit of gardening. The many and different methods adopted for the increase and continuation of plants of widely different nature, both useful and ornamental, necessitates the exercise of much care and skill on the part of even the most intelligent gardener. While it must be admitted that with some species and varieties propagation is an easy matter, others will develop to such an extent without any human assistance that to restrict them within reasonable bounds is often the cause of much anxiety and labour. Others, again, may be raised in goodly numbers with comparatively little care and attention if the main features for their well-being are complied with. There, however, remain many which call for considerable practice, patience, and skill on the part of the operator. Thus, the services of a clever and successful propagator are usually esteemed and recognised by his employer, whose desire it is to supply the market with young plants that may be relied on to thrive and to succeed satisfactorily.

In all the different branches of gardening there is possibly none which excel in interest and fascination that of raising plants by the different methods of propagation in vogue. To be successful it is a great advantage

to possess a knowledge of the requirements of the different genera and species. All this adds zest to the enterprise, and satisfaction when the desired results are achieved.

Propagation is not only used as a means of increasing the number of plants for special purposes, but also as an aid to the production of pleasing or useful variation, as well as to render some more luxuriant, or it may be more restricted, in growth, or, what is considered still more important in regard to fruit and flowers, to create a higher degree of fruitfulness or a greater tendency to flower production instead of a too rampant growth of wood and foliage.

Of late years special efforts have been made by means of hybridisation and propagation combined, in connection with that most wonderful and curious family the *Orchideæ*, to increase their vigour, curious forms, and wonderful variations of choice and unusual colourings in the blossoms, and, what is more, have been attended with phenomenal success. So great an effect has this produced from a commercial point of view that the collecting of new species and natural hybrids from their native habitats has been no longer necessary to anything like the extent it was previously. Hybridisation and the raising from seed—which is propagation—has opened a new field of discovery, and the results have exceeded all anticipations.

It will be the aim of this little treatise to explain as clearly as possible some of the more important methods by which plants are propagated. The matter presented will be the outcome of practical experience, observation, and collected information extending over a long and varied horticultural career, and it will be given in such

a manner as to prove interesting and instructive to those who have not had the same facilities offered them.

The art of plant propagation is of very ancient date, it having been successfully practised so long as we have any historical records. At the present time it has so developed and improved that it may reasonably claim to be associated with science in its different bearings on plant life in widely distributed regions. The utility and absolute necessity of agriculture and horticulture for the benefit, happiness, and even existence, of civilised man have been so often dealt with that it would be difficult to introduce any new features of interest that have not been explained many times before.

For easy reference each section of this manual will be dealt with separately, and will be followed by a necessarily brief enumeration of important and popular plants, with the best methods of increasing them.

PLANT PROPAGATION

CHAPTER I

SEED AND SEEDLINGS

AROUND us, both at home and abroad, we observe that plants are propagated naturally by different means, but the majority are reproduced either by seeds or by spores. Of the latter we shall deal more fully when treating on



YOUNG FERN GROWING FROM PROTHALLUS. (Slightly Enlarged.)

p, Lower surface of prothallus; *rh*, root-hairs of prothallus;
fr, young frond of Fern.

Ferns. Again, we observe in Nature that very wonderful and extraordinary means are employed to bring about cross-fertilisation and to prevent inbreeding, the progeny thus continuing to be reproduced without any weakening of their primary vigour.

PLANT PROPAGATION

To make a fair start in raising cultivated plants from seed, the crop should be well ripened, carefully harvested, and properly cleaned. If not intended to be sown at once, they should be preserved under such conditions as will ensure the germs remaining in a vegetative condition. To attain this end different means are adopted, according to the nature of the seeds. Some will retain their germinative powers for a very considerable time, while others quickly lose life if not sown almost immediately after they become mature.

A large number of our garden seeds have to be stored in paper bags or packets until the following spring, to await favourable conditions of temperature and light for their sprouting and developing. In such cases the majority keep in good order if placed in a seed-room or other place with an equable temperature of about 45 degrees, and with a sufficiently dry atmosphere that they do not become mouldy and attacked by fungus.

Many kinds of tree seeds have to be treated in a different manner, such as mixing them with slightly moist sand or soil, so that the outer covering does not become hard, contracted, and shrunken, and the germ dried up. In nature the Horse Chestnut and Oak afford very good examples of this. The Chestnuts and Acorns ripen and fall to the ground, and a little later on the leaves drop to cover and protect them in a measure from extreme changes of temperature and moisture. In sending such seeds abroad or in importing such from foreign countries, it is customary to pack them in a medium such as soil, charcoal, or coconut fibre, to assist them to retain their vitality during transit. With the seeds of some aquatic plants, such as the *Victoria regia*, it is necessary to keep them in water or they soon lose the

power to grow. When favourable conditions can be afforded, many seeds sprout much more regularly and quickly if sown as soon as they have ripened and been cleaned, for if held over for any length of time the outer coverings in some cases become so dry and hardened that they are almost impervious to moisture, and only grow after the lapse of long intervals.

Seeds are of various sizes, ranging from that of the



SEEDLING PLANT OF WEIGELIA (DIERVILLA) ROSEA IN FLOWER.

Double Coconut, weighing from 30 to 40 pounds, through different grades, to those of Orchids and Begonias, which are merely dust-like particles.

Many seedlings fail to appear above ground through the seeds being sown too deeply, and the seedsman is censured and accused of supplying an inferior quality. A very good general rule is to cover with a thickness of mould equal to the diameter of the seeds in question. Even this rule is subject to some modifications.

Germination of many seeds may be hastened by subjecting them to a long or a short soaking in warm water,

which should, however, not be at such a high temperature as to risk injury to the growing-point. Some kinds will not only grow more quickly, but appear to derive benefit through this process. It should, however, be remembered that when once they have been soaked in water they should not be allowed to become dry either before or after sowing—at any rate until they have developed a fair amount of roots and foliage. Those, such as Palm seeds, that are sometimes put in trays of water over the hot pipes in the hot-house until they show signs of sprouting should never be transferred to pots of cold soil, but have some specially prepared and warmed ready to receive them, so that they sustain no check.

Germination.

We understand by this term that a seed is in the act of sprouting or vegetating. In order to bring it about, the seed must be exposed to a certain temperature above freezing-point, according to its nature. Seeds of tropical plants, of course, need more heat to excite the embryo to activity than those natives of colder regions. There must also be moisture and atmospheric air. Many examples have been recorded of seeds that have been buried to a depth where the air could not penetrate remaining in a dormant condition until raised to the surface and influenced by the combined effects of heat, air, and moisture. For a long time a period of darkness was considered necessary to effect germination, but later investigations have proved that this is erroneous in at least some instances.

Some seeds with very hard shells, such as various Nuts, *Nelumbiums*, *Cannas*, certain Palms, and many

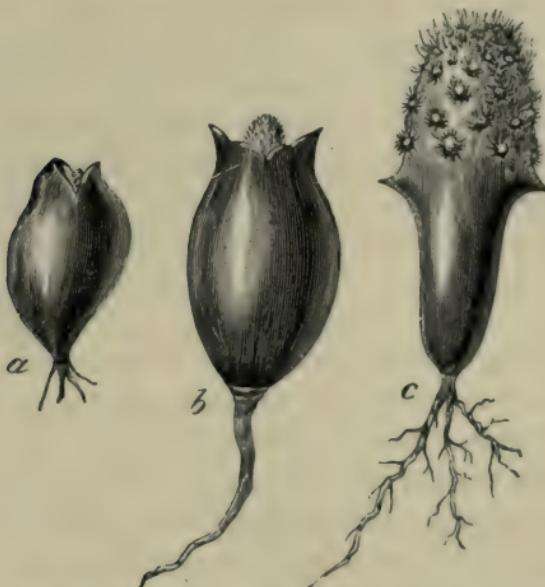
of the *Leguminosæ*, may be hastened into growth by filing or boring through the hard shell (taking care not to injure the embryo), submitting them after planting to moisture and a bottom heat of about 80 degrees, and thus treated they grow much more quickly.

In acquiring a parcel of seed it is often desirable to test the quality in order to have some idea of the percentage that may be expected to grow. There are several methods of doing this, such as throwing them into a vessel of water, whereupon those sinking to the bottom are generally supposed to be good, while those floating are bad. It is only with comparatively few kinds that this test can be relied on, as many good seeds will float in water, that being one of the natural vehicles for their distribution. A better idea of the quality can often be gained by cutting a few through the middle and examining the sections, when an experienced eye can generally determine by the appearance if they are good or bad. Perhaps the best, and that mostly practised, is to count out from a fair sample a certain number—say a hundred—to sow them on the surface of a pot of soil, and to place them in a warm house, treating as other seedlings. If after a few days ninety show signs of sprouting, that is about the percentage that may be expected to grow under equally favourable conditions. If to be sown out of doors under less propitious circumstances, the percentage would possibly be lowered.

In garden practice there are two principal ways of sowing seeds—by scattering broadcast and sowing in drills. The latter is generally the more advantageous, as it permits of the free use of the hoe between the rows to loosen the soil and to destroy weeds. It also facilitates lifting the young seedlings with a fork at the time

of transplanting, so that they can be removed without much injury to the roots after the soil has been loosened.

Seed is often wasted and injury done by sowing too thickly, the resulting young seedlings when they come up being so crowded that there is not sufficient space for the free passage of light and air between them; consequently they run up weak and slender instead of being

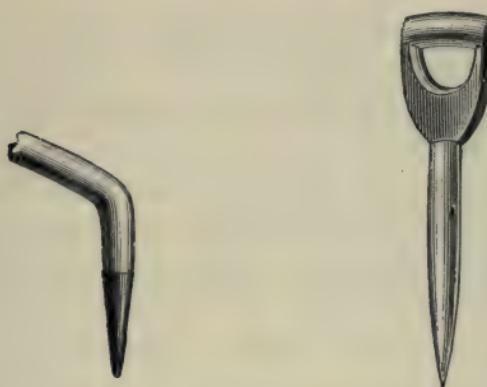


SEEDLINGS OF CEREUS. (Magnified Six Times.)

a, One month after germination; *b*, two months after germination; *c*, three months after germination.

sturdy and strong, and extra labour is required in thinning them out.

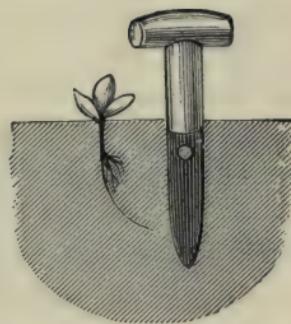
Many seeds germinate much more regularly and rapidly by being subjected to a higher temperature than that in which the plants are to be grown, and are benefited by a slight bottom heat such as may be obtained in the propagating-house or by making a hotbed of litter



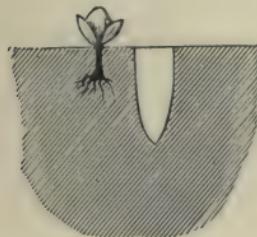
DIBBERS.



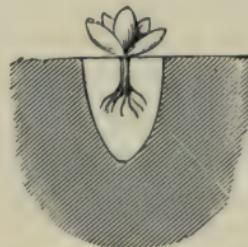
Position of dibber for press-
ing the soil against the
roots.



Position of dibber when soil
has been pressed to the
roots.



Dibber removed, leaving hole
for watering.



A more careful method to fill
in soil with the hands.

and leaves, covered with a garden frame. When the excessive heat to which the hotbed will rise has declined to a temperature of 75 degrees, seed-pans and boxes may be stood on or plunged in the material. In such cases the seedlings must be gradually hardened off and placed in a position near the glass to prevent them from becoming drawn up weakly, and air admitted on all favourable occasions. Such a hotbed covered with a layer of about 9 inches of soil is very useful in the spring for raising Celery, Stocks, Asters, Zinnias, etc., as it is desirable to get forward early.

The receptacles in which seeds are to be sown may consist of flower-pots, seed-pans, or shallow boxes 3 inches deep. Where the last named are extensively used, a saving of space is effected if they are all made of the same size, either square or oblong. Whether pots, pans, or boxes be used, they should be clean, dry, and well drained before the soil is put in. There should be ample outlet at the base, so that surplus water may drain away freely and not be allowed to sodden and to sour the compost.

For small seed the soil should be sifted through a $\frac{1}{4}$ or $\frac{1}{2}$ inch sieve, and may consist of loam 2 parts, well-decayed leaf-mould 1 part, and sand $\frac{1}{2}$ a part. With peat-loving plants peat may be substituted for the loam. Let it be a rule when the seed is of a reliable quality to sow thinly, and as soon as the young seedlings are big enough to handle either to pot them singly into small pots or to prick them off into pots, pans, or boxes filled with fine compost, but not quite so fine as that used for raising the seed.

A pointed wooden label answers very well for lifting the young plants, and a small dibber made of any hard

wood is suitable for planting them. Care should be taken that the roots are not bent and doubled into a mass, and that the soil is pressed around with moderate firmness.

Shading from bright sunshine will be necessary in all the early stages, but it should not be kept on longer than is absolutely necessary if short-jointed, sturdy plants are desired.



GYMNOGRAMME LEPTOPHYLLA : YOUNG PLANTS FROM SPORES.

Efficient drainage of pots, pans, and boxes used for propagating is of primary importance to allow the free passage and escape of superfluous water, thus preventing the compost from becoming water-logged, sour, and stagnant. The pots and crocks should be clean and dry when ready for use. Preference is given to pots that have been in use before, these being less absorbent than those fresh from the kiln.

When propagating by seeds in the border or the open ground, it is much more economical, owing to the great

saving in the quantity of seed necessary, to sow in drills. They can also be more evenly covered the proper depth than when sown broadcast. The facilities for hoeing, stirring the soil, and destruction of weeds are also greatly increased.

In watering beds or pots of fine seeds great care is needed, or they may be washed together in masses or



ORCHID SEEDLINGS (SIX MONTHS).

floated away altogether. A very fine spray with the water-pot will answer for many, but in the case of extremely fine seeds and Fern-spores it is better to grasp the pot by the rim, to dip it into a vessel of water, allowing the water to percolate through the hole in the base, and to rise up through the soil inside to near the surface, but not to permit any to run over the rim of the pot.

Hardening-off is really gradually inuring young plants to more air and a reduced temperature in order to render them sturdy and strong and to avoid sudden checks to foliage or growth.



ORCHID SEEDLINGS (TWO YEARS).

It sometimes happens that " damping-off " is destructive to pots of young seedlings, causing them to bend over and droop down, and finally to decay. It is caused by *Pythium de Baryanum*. The best preventive measures against such attacks are to sterilize the soil before sowing seeds or spores, to provide good

drainage, to sow thinly to avoid overcrowding, to ventilate sufficient to carry away an excess of moisture, and to water carefully so that the compost is not kept continuously in a state of saturation. If an attack be observed in its early stages, the seedlings should be immediately replanted in fresh compost, and the old soil and the affected seedlings burned to prevent the spores of the fungus from spreading.

Seedlings do not always come true, but show variations of character. In some cases of varieties that have been in cultivation for a number of years, if two of the same genus are grown in close proximity to each other, the resulting progeny from the seed will be considerably changed. Especially is this frequently the case with many of the Brassica family. For this reason seedsmen desirous of keeping their strains of choice sorts true have them grown far apart in isolated localities, to prevent bees and other insects from conveying the pollen from one to the other, and thus, as far as possible, preventing cross-fertilisation. Another practice with them is to go over the ground, "rogueing" the crops—that is, pulling out and destroying any plants that do not exhibit the normal character, such as rampant growers instead of dwarf, compact examples, or, in the case of flowers, destroying before they seed any that do not come up to the standard of excellence desired either in colour or in habit of growth.

For the production of fruit and fertile seed, fertilisation of the flowers is needful. This is in some cases effected by the distribution of pollen by wind or insect agency. Artificial pollination with the aid of a camel-hair brush or by other means is sometimes desirable. In the case of species where the sexes are in different

individual plants, such as the Sea Buckthorn and Aucuba, it is customary to plant one male tree among a group of the opposite sex to ensure the production of berries.

Seeds with fleshy coverings, such as those of Hawthorns, Hollies, Roses, and Plums, should, as soon as gathered, be stratified in soil—that is, placed in alternate layers of seed and soil to assist in the decomposition of the pulp. In nurseries where quantities of seeds are thus treated the mass is termed the “rot-heap.” A twofold advantage is gained in this, as the vitality of the germ is retained unimpaired, and in the case of such as the Holly and Hawthorn, which are raised by the thousands for the formation of hedges and other purposes, the seeds do not germinate, if sown, until the second spring after ripening, so that if they are kept over in the rot-heap, where they may remain exposed to all weathers instead of sowing them soon after ripening, the ground thus saved is available for other crops for over a year. There is also a considerable saving in labour, which would otherwise be fruitlessly expended in weeding the seed-bed and keeping it clean.

The rot-heap should be made in a position where surplus water will drain away freely, and should be cone-shaped in form, to run off any superfluous water that would otherwise cause an excess of saturation. Sufficient soil should be used in proportion to the quantity of seed, to prevent the mass from becoming unduly heated—usually about equal quantities of each. Seeds of such kinds as may be attractive to mice or other enemies should be watched, and means taken to prevent their destruction, if necessary.

Similar seeds of exotic plants, such as Coffee, Cocoa,

and some Palms, that would be injured by extremes of cold, should be macerated and washed in water and then sown, or be arranged in layers with moist sand in a flower-pot or other receptacle, and placed in a sheltered position safe from injury until a suitable opportunity for sowing them occurs.

CHAPTER II

DIVISION

A MULTITUDE of both hardy and tender plants can be readily propagated by this method, which is probably the simplest and most successful of all. Such kinds as grow in masses, forming rootstocks from which a number of rooted growths are thrown up from the base,



YOUNG CROWN OF LILY OF THE VALLEY FOR PROPAGATING BY DIVISION.

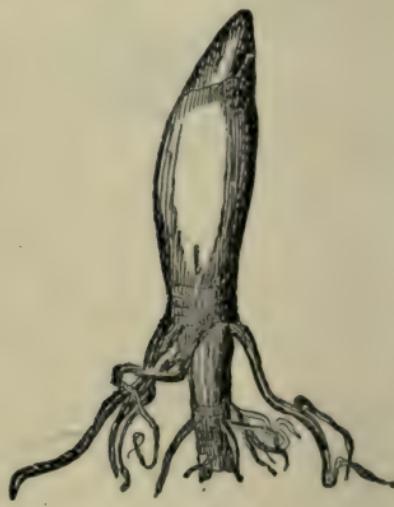
simply require dividing into pieces, which when replanted form separate plants. Familiar examples that lend themselves to propagation by division are the perennial Phloxes and Sunflowers, Box-edgings, many Orchids, and Ferns; indeed, it is the only means of increasing the beautiful *Adiantum Farleyense*, no fertile spores being produced. Other cases are Aspidistras,



a



b



c

CROWNS OF LILY OF THE VALLEY.

a, One year old; b, two years old; c, three years old.

Marantas, Vallisneria, and most plants of tufted habit that root freely at the base.

As a general rule the best season for the operation is just as new growth is about to commence. With hardy herbaceous plants the best and most vigorous pieces are obtainable from the outsides or margins of the clumps. The operation consists in digging up the masses and dividing them into convenient-sized pieces, then replant-



SURFACE RHIZOMES OF GERMAN IRIS SUITABLE FOR DIVISION.

ing them in a suitable soil and position for their healthy growth and development.

Runners.

Certain plants, such as the Strawberry, Potentilla, and *Saxifraga sarmentosa*, send out slender prostrate stems called runners, producing roots and leaves at the nodes a short distance from the main tuft. These are capable of forming young plants. By this means of propagation numbers may be increased almost indefinitely.

When it is only necessary to procure a limited number, pots filled with suitable soil may be placed for them to root into, securing them in position with a stone or a peg until the roots have penetrated the soil, and keeping any further growing-points pinched out to throw all the



SAXIFRAGA SARMENTOSA TRICOLOR, SHOWING RUNNERS.

nourishment supplied by the parent plant into the young runner; this, when well rooted and fully established, may be severed from the old plant to supply its own nourishment and to support itself as a separate individual, which will soon result if the soil in the pots be kept constantly moist.

Suckers.

Many plants are extended in size and reproduced by suckers—*i.e.*, growths which spring up from underground portions of the roots and stems. These can often be dug up with roots adhering and be planted with safety. Filberts, Lilacs, Raspberries, and Briars for standard Roses are often thus procured. Owing to the liability of plants so obtained to throw up suckers to the disadvantage in vigour of other portions, this method can only be recommended in comparatively few instances where other methods are apt to fail. When such are utilised as stocks for grafting and budding, the constant tendency to produce suckers from the base below the graft is often the cause of much annoyance.

Bulbs.

All true bulbs belong to the Monocotyledonous plants, or Endogens, but in popular talk any fleshy vegetable masses growing in or at the surface of the soil are spoken of as bulbs. True bulbs, such as Onion, Lily, and Hyacinth, have a flattened fleshy plate, or disk, at the base, from the lower side of which roots are protruded, and surmounted with scales, sometimes loose, at other times closely folded around, which, as a matter of fact, represent buds. With some these are formed naturally as offsets in such abundance that the species or varieties may be easily increased by dividing them, as is the case with the Common White Lily of our gardens. Others will go on flowering or increasing in size, but rarely produce offsets or bulbils. The propagator then takes measures to induce them to do so by different artificial means of diverting and arresting the course of the sap,



LEUCOIUM VERNUM, SHOWING HOW OFFSETS ARE PRODUCED.



GARLIC, SHOWING OFFSETS.



ROOT OF ACHIMENES, SHOWING TUBERCLES.

such as by cutting out or otherwise destroying the central bud, thus causing numerous other buds to be produced, from which offsets result. A similar effect is caused by making a cross-cut upwards through the fleshy disk at the base, extending to the seat of the scales, or by making slashes downward through the outer scales and



BULB OF LILIUM, SHOWING LOOSE SCALES.



YOUNG BULBLETS
OF LILIUM FROM STEM.

penetrating to the basal disk. Another plan is to scoop out a hollow cavity in the bulb from below.

Many bulbous plants of a gregarious nature, such as Daffodils, Snowdrops, Crinums, and Eucharis, develop offsets freely enough for all ordinary purposes, which may be removed and grown on to a flowering size without adopting the more artificial methods. Some of the Lilies, such as *L. bulbiferum*, form bulbils in the axils

of their leaves; such may be grown on, or the scales of the bulbs may be broken off and planted in sandy soil to supply young plants.

When raised from seed, although some species become strong enough to flower in two years, many bulbs do not attain to flowering size and exhibit their true characters until they have been grown on for several years.



GLADIOLUS CORM, SHOWING
MODE OF INCREASE.



CYCLAMEN PERSICUM, SHOWING
CORM AND MODE OF ROOT-
ING.

Corms.

These are often confounded with bulbs and called such. They differ in consisting, not of scales, but of a solid fleshy mass, although a slight outer covering sometimes exists, as in the case of Gladioli, Ixias, and Crocuses. These are propagated by planting and tending the young corms produced at the base and around, which in Gladioli

are called "spawn." Varieties that do not produce spawn may generally be induced to do so by slightly wounding or slashing the corm with a knife, but if so treated they must not be subjected to too much moisture when planted or they will rot. Cyclamens are best raised from seed, and the perennial corms so obtained will flower well a second season. Caladiums also belong to this section, and may be increased by division or by cutting out the growing eyes with a small portion of the fleshy mass and roots attached when growth is starting in early spring.



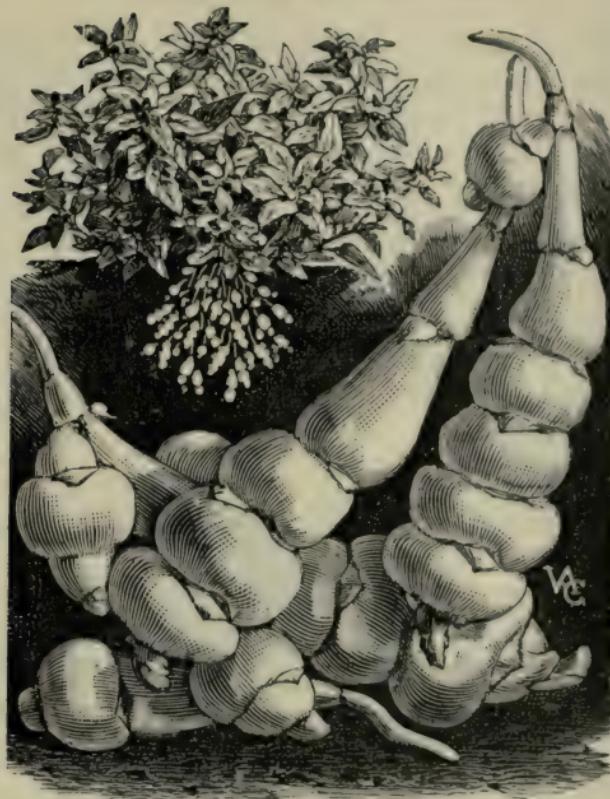
TUBERS OF JERUSALEM ARTICHOKE.

Tubers.

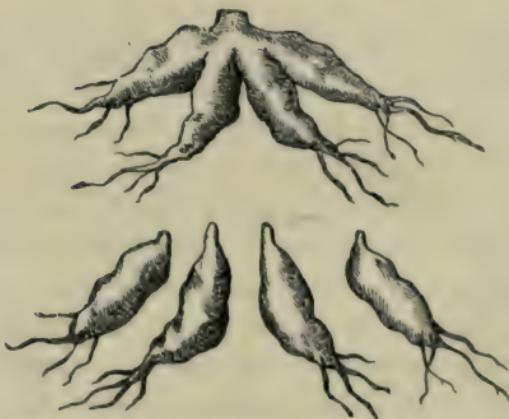
Good examples of these underground fleshy stems covered with buds are the Potato and the Jerusalem Artichoke. It is well known that these may be cut into as many pieces to rear new plants as there are buds—generally called eyes—present. Or the sprouts of Potatoes, when number rather than size is desired, may be broken off and planted; and a second or a third crop will then quickly be ready for similar treatment.

The large solid masses attached to Dahlias are not true tubers, as they do not bear buds, but are fleshy

PLANT PROPAGATION



CORRUGATED TUBERS OF CHINESE ARTICHOKE.



DAHLIA ROOTS, SHOWING TUBER-LIKE ROOTS, WITH MODE OF DIVISION FOR PROPAGATION.

reservoirs in which starch and future nutrition are stored; therefore a crown bud should be present at or near the summit of each piece, such as those in the illustration, or growth will not ensue, as adventitious buds are not readily produced in these.

CHAPTER III

LAYERS

PROPAGATION by layers is a very old but useful and much practised method, as many plants can be thus safely increased that cannot with reliance be multiplied by other means, the prospective young plants being thus



LAYERED CARNATION SHOOT.

nourished and kept alive until sufficient roots have been produced to ensure their safety. It is the principal means by which such subjects as *Chimonanthus fragrans*, *Lapagerias*, Border Carnations, Magnolias, and many others, are reproduced.

For different kinds and in different circumstances several systems of layering are employed, and although partaking of the same general character they are subject to many modifications in detail. This depends largely on the habit of growth of those under treatment and the length of time necessary to effect the desired result. Speaking broadly, layering consists of placing a branch or a stem in contact with the soil, and affording such other treatment as will encourage the formation of roots by arresting the downward flow of the elaborated sap. The means adopted to bring about this result are principally bending, twisting, tongueing, ringing, piercing, splitting, and notching.

For hardy subjects amenable to outdoor treatment firm or ripened shoots are preferable. With soft-stemmed herbaceous plants and evergreens it is generally advisable to remove the leaves from the portions of the stems that will be covered with soil. There are, however, a few exceptions to this rule, as in the case of *Lapagerias*, the layered shoots of which it is customary to cover with a shallow layer of compost, with the leaves left entire, exposed to light and air; and immediately a shoot is seen growing from the axils of the leaves a stick or a piece of laid cord is fixed by which it may climb upwards to the roof.

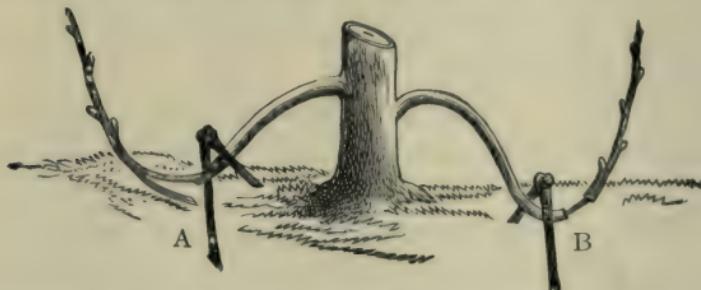
Bending.

This is the simplest of all, and is suitable for such subjects as root tolerably freely. The stems or branches are merely bent down into prepared soil, fixing the underground portion with a peg to prevent it from shifting, and each extremity is supported with a stake to keep it in an upright position. Only a few buds towards the

top should be retained, removing all those that will be buried under the soil. Also, any buds that may exist between the parent stem and the layered portion should be effaced, or at any rate suppressed, otherwise nourishment would be used up that should go towards building up the new plant.

Twisting.

The same details are followed as above, with the addition of giving the portion of the stem to be buried a



LAYERING BY—(A) TONGUEING OR HEELING, AND (B) RINGING.

twist to rupture the tissue, and so to check the downward flow of the sap and thus to aid the emission of roots.

Ringing.

This method can be understood by referring to the illustration. A ring of the outer and inner bark is removed. The upward flow of the sap will proceed, but, the descent being checked, roots will be emitted.

Tongueing.

This is an excellent and widely practised method. It consists of making an incision with a sharp knife be-

low a joint half-way through the branch, and extending it in an upward direction, as shown in the Carnation layer (p. 26). This tongue may vary in length according to the size of the layered branch. In pegging down, the slit should be kept open. With woody plants a small stone may be inserted to prevent the opening from closing and healing over.

Piercing and Splitting.

The layer is bent downward in the ordinary way, and an incision made with a sharp instrument, such as



LAYERING BY PIERCING OR NOTCHING.

a knife thrust through the middle of the branch, splitting that part which is to be covered with soil, and inserting a small stone between to prevent it closing up.

Above-Ground Layering (Circumposition).

This is a very old method of layering, and, although not much used at the present day, may sometimes be adopted with advantage when the branches to be layered are too high to be bent to the ground. It is also useful to correct the unsightly appearance of India-rubber plants and Dracænas that have lost the lower leaves and become "leggy." Either boxes or flower-pots, cut in

two, with the holes in the bottom sufficiently enlarged to allow the stems of the subjects under treatment to pass through, may be used. The stems are then tongued, ringed, or notched at the place where roots are desired. The two halves of the flower-pots or boxes are then put in position and tied together, and supported by props or the best means available. The pots are filled with compost and kept moist by a covering of moss or straw bands, and syringed daily to induce roots to form. When sufficiently advanced, a partial incision is made in the stem below the receptacle, and gradually increased day by day. When sufficient roots have formed to support the top the lower stem is entirely removed and the renovated plant kept in a close, moist atmosphere with shade from sunshine until completely re-established.

Serpentine Arching.

This plan answers very well for creepers and trailing subjects with long, firm shoots, such as *Aristolochias*, *Wistarias*, and *Rubus*, as several plants can be reared from one long branch. The shoot is bent down to the ground, tongued or notched under the joints to be buried, pegged down, and covered with soil. The intervening spaces are curved in loops above the ground, each loop bearing either a branch or a growing bud. When well rooted the stems are severed and the resulting plants transplanted to the positions they are intended to occupy.

Growing-Point.

A method of layering which sometimes occurs naturally with the Common Blackberry, and may be utilised with advantage for rearing scarce varieties of Gooseberries,

Currants, and Rubus of the ornamental and fruiting kinds. The growing-point is pegged down to the soil in summer to encourage the emission of roots, which in autumn are sufficiently abundant to admit of transplanting with safety.

CHAPTER IV

CUTTINGS

NEXT to raising plants from seed the system of propagation most extensively practised is that of striking or rooting cuttings. By this method the characters of the parent are exactly reproduced, which is not always the case with seedlings, as they are often subject to considerable variation.

A very large proportion of cultivated plants can be readily propagated by cuttings, although distinct methods and treatment are imperative to effect it with any degree of reliance, according to the different kinds of plants it is wished to increase. Some cuttings grow readily when made from the young and soft growth of the stems of herbaceous plants; others from the hardened wood of the current year's growth, such as Currants and Gooseberries; Vines and Hollyhocks from single eyes. With many, cuttings of the leaves is an interesting way of raising a stock of the Rex Begonias, Gloxinias, Saintpaulias, and many other fleshy-leaved subjects, while root-cuttings provide a safe and easy way of increasing vegetables, flowers, trees, and shrubs, common examples of this method being Horseradish, Seakale, Bouvardias, Clerodendrons, Clematis, Poplar, Rhus, and most trees that throw up root-suckers.

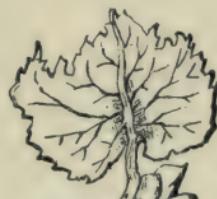
In connection with this method of propagation one important rule should be strictly observed, and that is to

select the material from clean, healthy specimens, free from insect pests and disease of any kind.

In the successful rooting of cuttings of indoor plants much depends on the season chosen for the operation



VINE EYE.



VINE EYE STARTED.

and the selection of suitable growth for the purpose. As a general rule, the spring or the early months of the year are the most suitable, as the resulting young plants have then a long season of growth before them in which

to become sturdy before the approach of the dull days of winter. Many hardy plants—such as Roses, Currants, Gooseberries, and Laurels, to be planted outside on a sheltered border—are best handled in the autumn, so that a callus is formed at the base which roots and grows quickly as the warmth of spring encourages vitality.

A large number of both foliage and flowering subjects may be induced to provide a quantity of excellent young growths in spring by placing the old plants in a moist and higher temperature; the young growths that sprout from the branches, cut off with a heel of the old wood, with the usual treatment afforded, then strike root freely and quickly, whereas at a later season they would be much more difficult to deal with successfully.

It is generally considered that cuttings root at the base by the downward flow of the elaborated sap being arrested at the place where severance was effected, a callus being formed of spongy cells, through which roots in due course are protruded. Most stem-cuttings succeed best when cut through immediately below a joint or node. With many plants, however, such a nicety of preparation is quite unnecessary, as they may be induced to produce roots freely if cut a sufficient length to hold the cutting in position when planted, provided only one node is retained; but in such cases it is advisable to insert the stem into the compost to the base of the leaves, when new growths will spring from the axillary buds. Verbenas and Fuchsias are amenable to such treatment. In fact, propagators for the trade, when desirous of increasing scarce varieties quickly, will split such cuttings down the middle, leaving only one bud to each half, so that from a few sturdy plants to commence with a large number is soon obtained. There are some cases



HORSERADISH, SHOWING THONGS
SUITABLE FOR ROOT-CUTTINGS.

YOUNG PLANT OF YUCCA FROM
ROOT-CUTTING.

where bottom heat applied to newly inserted cuttings would prove fatal, but in the majority of instances bottom heat, a higher temperature, and closer atmosphere, are beneficial. The general exceptions are in the case of ripened shoots inserted in the autumn and wintered in a cold frame or pit; these should be allowed first to callus at the base; then a little extra bottom and top heat in the spring will stimulate the production of roots and top growth. This, however, should not be continued indefinitely, but when the young plants become established gradual hardening-off, free ventilation, and ordinary treatment of adult plants should be the order.

"Heel" is a term used when speaking of propagation by cuttings. It consists of a portion of the older wood from which the cutting was taken; this provides a large surface from which roots may be protruded, and is just sufficiently solidified to be in the right condition for the purpose.

A compost suitable for the majority of cuttings propagated in pots, pans, and boxes may consist of sifted loam and leaf-mould, with a liberal admixture of silver or river sand free from iron, the pots being surfaced with about $\frac{1}{2}$ inch of pure sand. Peat-loving plants, such as Heaths and Epacries, should have a compost of equal parts fine peat and silver sand and the pots surfaced with pure sand. In all cases the receptacles, whatever used, should be adequately drained with crocks or other material, so that there may be no fear of stagnation, and that the surplus water may drain freely away.

When inserting the cuttings, whether this be done with a dibber or otherwise, care should be taken to press the compost close up to the base, so that no hollow air



SUITABLE SHOOT FOR MAKING A CUTTING.



CUTTING PARTLY PREPARED.



SOFT-WOODED CUTTING READY
FOR INSERTING.

space is left. When using pots, commence by inserting the cuttings close round and touching the insides of the pots. For some reason they always grow best in that position, but in most cases the middle may be planted also to economise space. Never crowd them too closely together, as that tends to encourage the development of



HARD-WOODED CUTTING OF
EUONYMUS JAPONICUS.



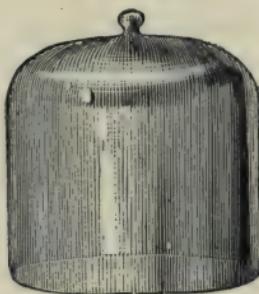
SOFT-WOODED CUTTING :
VERBENA.

the "damping-off" fungus, which if once it gets a foothold proves rapidly destructive. Watering with a weak solution of permanganate of potash or Condy's Fluid (diluted to the colour of sherry) is recommended to check the spread of the pest without injuring the cuttings. The pots should in all cases be looked over each morning, and any decaying leaves or traces of mould immediately removed. If sawdust is used as a medium in which to strike cuttings liable to damp-off, it should be that obtained from non-resinous timber, not from pine or other coniferous trees which abound in resin.

Bell-glasses, handlights, and propagating-cases, are all useful appliances to the propagator—in fact, without them the endeavour to strike many kinds would have

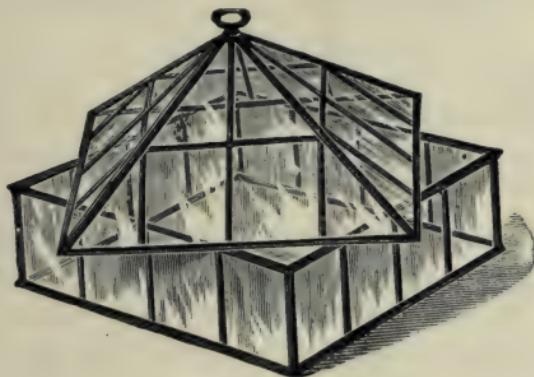


FRENCH BELL-GLASS, OR CLOCHE.



ENGLISH BELL-GLASS.

to be abandoned. Cuttings should never be allowed to flag or wither. The leaves should be kept fresh and firm, so that they may perform their natural function of



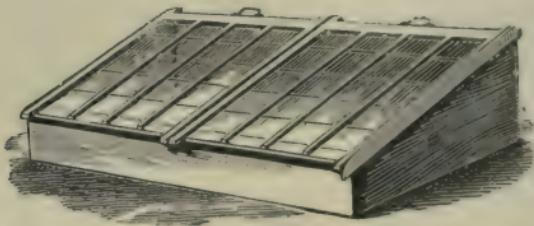
HAND-GLASS.

elaborating and circulating the sap. By placing a bell-glass over a pot of cuttings the circulation of dry air around them is prevented, and the interior atmosphere is kept moist, thus avoiding excessive respiration from the foliage, and most of the leaves may be left entire.

If such means are not available the foliage should be reduced, or the life of the cuttings will be dried out by transpiration through the leaves before roots are formed to supply the deficiency.

Hotbeds, made with fermenting materials, such as stable litter, dead leaves, and tan, with a glazed frame on top, prove very suitable for striking and raising many kinds of cuttings and seeds.

A good knife with a keen edge should always be used in preparing the cuttings, so that a very smooth surface results. For cutting large and sometimes hardened



TWO-LIGHT FRAME.

stems of such plants as Dracænas a good pruning-knife, well sharpened, is useful, but for small cuttings a propagating-knife is much more suitable; while for removing the lower leaves of small-leaved cuttings a pair of propagating scissors may be employed with advantage, as the work can be executed much more expeditiously. Wooden or metal pegs should also be ready at hand to secure in position such cuttings as need this assistance, and small stakes provided to support leaves or tops that require them.

Succulent plants, such as the extensively grown *Kalosanthes coccinea*, contain so much moisture that they succeed better if laid on a shelf to dry before insertion. They do not need to be covered with a bell-glass,

but succeed better if placed on a shelf with a limited supply of water until well provided with roots and in full growth. The non-flowering shoots should be selected for propagation.

With such cuttings as need covering with bell-glasses to ensure a close, moist atmosphere to prevent flagging, the moisture that becomes condensed on the glass will sometimes run down, with a tendency to sodden the compost. In such cases the insides of the bell-glasses should be wiped dry with a cloth or a sponge each morning, and be left uncovered for about half an hour before being replaced.

All cuttings with foliage should, of course, be shaded from sunshine, otherwise they will droop and wither. The shading material should, however, be removed as soon as the sun's rays have passed, or weak and spindling growth will result.

When rooted, the young plants should be gradually inured to withstand the ordinary atmosphere of the house, be potted off separately into small pots, and placed in a position with plenty of light.

Plants in the cutting stage outdoors are lifted and loosened by the effects of frost. When this happens, the ground should be trodden down firmly again as soon after a thaw as convenient. It is also desirable to give some which are hardy under normal conditions slight protection during very severe weather by spreading straw or stable litter over the ground, while those in frames should have a covering of Russian mats or a layer of straw to protect them during cold wind and frost.

A useful propagating-box for cuttings, of especial utility to amateurs and others, may be mentioned here.

Having had some experience with and proved the usefulness of a propagating-box such as I am about to describe, I am able to speak of its merits in providing a ready and effective means of striking cuttings of almost all kinds of soft-wooded stove and greenhouse plants. It is not recommended for hard-wooded plants, such as *Ericas*, *Epacries*, and such kinds as require special treatment and the skill and attention of a professional propagator.

It often happens, when overhauling or rearranging the greenhouse or the conservatory, that a branch may be accidentally broken off or require removal or even pinching back to improve the shape or to maintain an even balance of growth. At such times, with the pressure of work on hand, there is often no time for preparing pots for cuttings, and the good material thus provided is generally thrown away.

My propagating-box consists of an ordinary strong deal box about 3 feet long, $2\frac{1}{2}$ feet wide, and 1 foot deep. Several large holes are made in the bottom to allow water to pass freely through. This is covered with broken potsherds, on which is placed a layer of fibrous siftings, and the box filled to within $\frac{1}{2}$ inch of the top with clean, well-washed river sand. It is stood on an open trellis stage at the front of a hot-house, just where the hot-water pipes enter, so that the warmth arising therefrom provides a moderate degree of bottom heat. In this are inserted cuttings of *Begonias*, *Fuchsias*, *Poinsettias*, *Oleanders*—in fact, of almost anything and at any season.

It is surprising what few losses have been experienced, and how quickly the small shoots make tufts of roots. When thus advanced, they are easily lifted from the

sand with a large pointed label and transferred to small pots containing a suitable compost, in which they flourish. A small bell-glass is generally placed near at hand to stand over anything choice or delicate, and so to prevent an undue evaporation through the leaves before roots are formed.

With such thorough drainage and with the porous material it is almost impossible to over-water. Applied with a rose watering-pot, the water runs through the sand almost like passing through a sieve. It is abundantly supplied twice daily in warm weather. A light shade is provided by stippling the front sashes and the glass-lights just over the box with whiting and milk. The material sold under the name of "Summer Cloud" answers this purpose admirably. On extra bright days it may be necessary to lay a sheet of paper over young, fresh cuttings during the hottest part of the day.

The above provides an easy and safe means of rearing a great variety of tender plants with a minimum of labour, always bearing in mind that the sand must of necessity be kept constantly moist to prevent the tender young occupants from flagging.

CHAPTER V

GRAFTING

THE term "graft" is applied to a small shoot or scion of a plant or tree inserted on another plant, the stock, which supports and nourishes it. Grafting is an art which has been practised from a period of remote antiquity; by whom it was discovered is unknown. The operation consists in placing two cut surfaces of one or of different plants under conditions which cause them to unite and grow together. The plant—usually termed the "stock"—on which the graft is inserted should in almost every case be provided with roots, for the purpose of drawing and transmitting nutriment to support the graft after a union has taken place. The part inserted is called the "scion," and is analogous to a cutting placed in the soil, although its growth is developed by nourishment supplied through the stock.

The action of the one on the other is frequently marked and very important. Some fruit-trees, for instance, grow freely on one stock, but scarcely bear, whilst on others they produce abundant crops, though they do not grow so vigorously. Nevertheless, although both are intimately connected, they retain their individual characters distinct. The stock will become enlarged by the elaboration of sap in the leaves of the scion without the nature of the wood in either case being

much altered, each part forming its own peculiar secretion from sap arising from the same source. Scions from variegated trees will frequently cause variegated shoots to develop on the stock far below the graft, and these can be used to increase the supply of a given form just as well as those produced by the original tree. The Golden Laburnum is a well known case in point.

The importance of the possibility of grafting cannot be over-estimated, as, by its adoption, the propagation of varieties of fruits, flowers, many forest trees, shrubs, etc., is rendered available, and the good qualities or habits of any are retained, without alteration, excepting such modifications as may be due to the superior constitution or special suitability of the stock. Grafting may also be employed for restoring defective branches on any part of an otherwise healthy fruit-tree, or for the insertion of fruit-bearing wood where there is a deficiency. Seedling fruit-trees are brought more quickly into a bearing condition by being grafted on fruit-bearing stocks so soon as sufficiently matured scions can be obtained. The two sexes of monoecious plants may, in some cases, be brought together on one stock in order to ensure eventually their reproduction by self-fertilisation.

Certain conditions are essential for attaining success in grafting. A great deal depends on the skill of the operator, the condition of the sap, a healthy growth in the stock and scion, and the season when the operation is performed. In order that a vital union may take place, it is essential that the two parts employed should have a natural affinity to each other, either as varieties of the same species, species of the same genus, or genera of the same Natural Order. In the works of

celebrated ancient writers accounts are given of various attempts having been made, and supposed unions effected, under conditions which have since been found impossible, on account of a natural affinity being non-existent. A temporary union has sometimes taken place, but not a vital and lasting one.

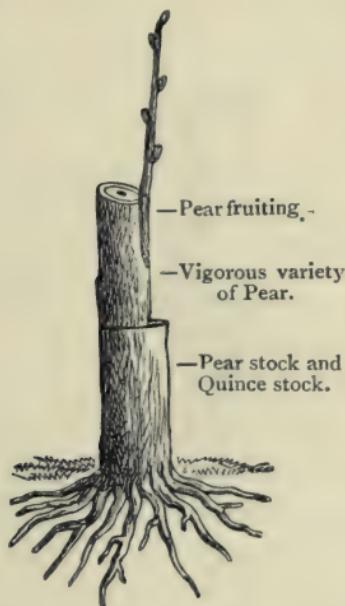
A fundamental principle, which applies to every method of grafting, is the necessity for forming a direct communication between the layers of inner bark in each of the parts to be united, as without this a perfect joining is not effected. The pithy or woody parts never unite, as may be frequently observed when grafting trees of long standing are cut down and the ends of wood originally placed in contact are found to have become decayed. Provided this essential principle be kept in view, the methods of grafting may be varied almost indefinitely.

The natural vigour of the stock and scion should be somewhat similar for inducing a steady growth, but at times it is preferable that the scion should be the hardier and more vigorous of the two. This is exemplified, and the desired results are obtained in many cases, by grafting various strong-growing varieties of Apples on the Paradise stock, Cherries on the Mahaleb, and Pears on the Quince. In these and other instances the stock is restricted in its root growth, and the supply of sap transmitted to the grafted portion is consequently limited. This latter condition tends to encourage fruit-bearing instead of vigorous wood, and proves, by results, the modifying effect of the stock and the superior results in productiveness thereby secured.

Double-grafting is sometimes adopted as another means for reaching the same end by having a variety of

intermediate growth inserted first on the stock, this to be ultimately grafted with the one it is intended to propagate. The illustration here given indicates what is meant in the case of double-grafting the Pear.

The special influence exerted on the part of the stock or scion with certain varieties in either direction can only be learned by experience. Grafting should be performed when the sap is in motion, between the time

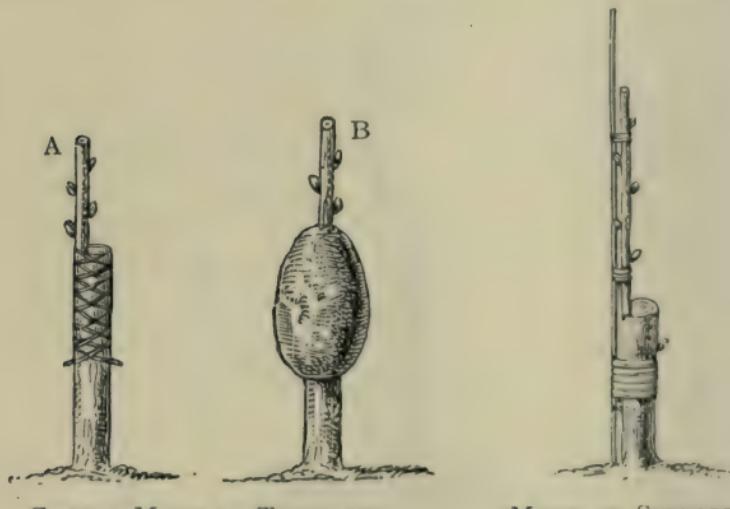


DOUBLE-GRAFTING.

when it begins flowing in the spring and a period before it ceases in autumn, avoiding the middle of summer or any very hot weather. It is most largely practised, both indoors and outside, in early spring, the scions being slightly retarded by keeping them in a cooler place, or, in the case of fruit-trees, previously cutting and inlaying them in the ground. Calm, moist weather is most

suitable for the operation outside, which should always be skilfully performed by means of clean cuts, a careful fitting of the parts together, and an exclusion of air by the application of grafting-clay or wax.

Close frames or cool houses are requisite for tender plants and for various evergreen trees or shrubs until the parts have become united. Many of these do not require any clay or grafting-wax if kept moist, quite



GRAFT : MODE OF TYING AND CLAYING.

MODE OF SUPPORTING GRAFT.

close, and shaded. Heat is unnecessary in the case of many hardy plants, a protection from the drying influence of wind and sun being all that is required.

There are various methods of grafting that may be successfully practised, according to the size or variety of subject it is intended to propagate or to improve. The following are those most generally used, and are all subject to slight modifications in varied circumstances.

A in the illustration at p. 48 shows the mode of tying the graft adopted with many fruit-trees, and B the work completed by the application of clay, which should be left in the shape shown and be carefully fitted to the stock and scion. This plan may be employed either for dwarf or for tall stocks. All grafts inserted outside should be protected and kept from moving by a stake, which should reach nearly or quite to the top, and have both stock and scion secured to it, to prevent the latter from becoming displaced (see illustration).

Whip-, Splice-, or Tongue-Grafting.

This is the best method, and the one generally and most extensively practised in this country. It is represented here, where A shows the stock, B the scion, and C the two fitted together and tied.

Whip-grafting is easily performed and is tolerably certain in its effects, provided the essential conditions be ensured and the work carefully executed. The stock should not be prepared until the graft is ready to be inserted, in order that the parts may be quite fresh. As will be seen from the illustration, A shows the stock ready for the reception of the graft. It will be seen that the stock is sawn or cut off level. Then an upward cut is made 2 inches or 3 inches in length; midway in this cut the knife is driven a little way downwards. The next process is to make a corresponding sloping cut downwards on the scion B; then make an upward incision as shown at d. If this is done neatly with a sharp knife and good judgment, the stock and scion will fit together exactly and be fairly firm, and the bark of each be in direct contact, as shown at C. When the exposed parts have been fitted as accurately as possible,

they should be bound with a ligature of woollen thread, or material of a like description, to hold everything firmly in position, and at once covered with clay or grafting-wax for excluding air and preventing the sun and wind from drying up the sap.

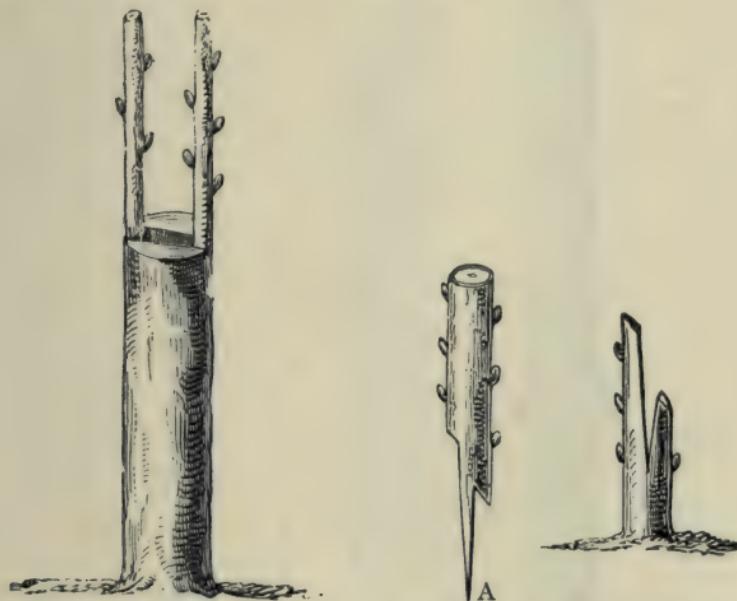


WHIP- OR TONGUE-GRAFTING.

Cleft-Grafting.

In this mode, which is a very objectionable one in many respects, the stock has to be split open by a chisel or other instrument, and the scion cut wedge-shaped and fitted in the cleft so that the inner barks may meet each other. The plan is largely adopted in some parts

of the country for woody, deciduous trees and plants with old stocks, which are split across, sometimes transversely each way, and two or more grafts inserted, according to the size. The objection is that the wide cleft necessarily made in the solid wood can never unite again in the centre, although, after some time, it may be partially covered by the scion growing over.



CLEFT-GRAFTING ON AN OLD STOCK.

CLEFT-GRAFTING WITH STOCK AND SCION OF THE SAME SIZE.

Another form of cleft-grafting illustrated is where stock and scion are of the same size. This also has some objections, the stock having to be split and fitted with a wedge (A), formed on the end of the scion. The cleft invariably extends beyond where it is intended the graft should reach, and, if this happens, the latter, when fitted, prevents that portion of the stock from again becoming united. The stock and scion should be prepared so that all the parts coincide.

Saddle-Grafting.

In saddle-grafting the stock and scion must of necessity be of nearly equal thickness, as the former is cut sloping on each side, like a wedge, and the latter is split up the centre and thinned to allow of it fitting



SADDLE-GRAFTING.

accurately on the top, as shown in the illustrations. It is important that the scion should not be split farther than the end of the stock will reach, and the wood in both should be clean-cut with a thin, narrow-bladed knife. For saddle-grafting the wood is usually young and vigorous; care must therefore be taken that the ligature is not made too tight at first, and that it is loosened afterwards before injury is caused to the bark.

This method has been successfully practised for obtaining dwarf flowering plants of Rhododendrons by grafting terminal shoots just before the flowering season arrives, and placing them in a close frame without bandaging or anything beyond a tie. In wedge-grafting the positions of parts are reversed, the scion being made



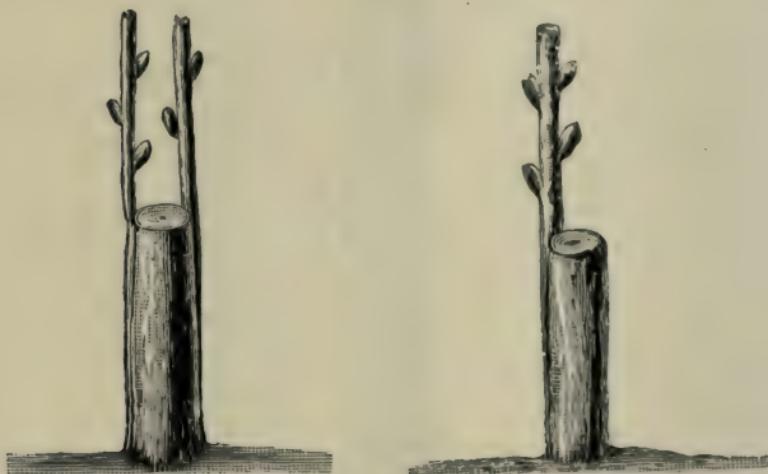
WEDGE-GRAFTING.

wedge-shaped and fitted into an incision of similar shape and size cut in the stock (see illustration).

Crown- or Rind-Grafting.

This has advantages over cleft-grafting, it being practicable to work stocks of considerable age and size without cleaving, and rendering the wood unsound. Crown-grafting is practised in spring, when the bark

easily separates; and with this method it has been recommended that the stocks should be cut down a month beforehand, the cuts being again made fresh at grafting time. The scion should be about 6 inches long, with two or three eyes attached to the upper part. The lower half is cut in a sloping direction, the same as the splice-graft, and the notch or shoulder formed in cutting it is made to fit on the top of the stock. It is then



CROWN- OR RIND-GRAFTING.

inserted between the bark and wood, which readily separate if in proper condition. One or more scions may be inserted, according to the size of the stem intended for their reception (see illustrations). The cut parts should be afterwards covered with a bandage, not made too tight, and with clay or grafting-wax. In what is known as *improved crown-grafting* the top of the stock is cut obliquely, and the bark only raised on one side of the longitudinal cut made for the reception of the scion, the motive being to increase the points of

contact between the two portions of bark and to accelerate their cohesion.

Side-Grafting.

For inserting scions without cutting away the head of the stock side-grafting is employed. This method is useful for propagating plants, and also for supplying,



SIDE-GRAFTING.

where deficient, a branch or a stem to any part of the tree (see illustration).

There are two systems of side-grafting—one by placing a simple, or occasionally a based, branch under the bark, and the other by inserting branches in clefts cut in the alburnum. A side-graft under the bark may either consist of a branch having what is termed a shooting-bud, or it may possess one that is dormant. If the former is selected, a branch of the previous year

forms the scion, which should be inserted about April, when the sap is flowing. Grafts with dormant buds are made from wood of the current year, and put in about August or September, to develop the following year. The scion may be prepared for the side of an upright stock by making a long splice-cut in the lower part, taking care to render it smooth throughout and thin at the point. Incisions, not penetrating the alburnum, are then made in the stock, and the scion is inserted in much the same manner as a bud, tied in, and covered with clay or wax. On horizontal branches the stock may have a notch cut and a portion of the bark raised nearer the tree (see illustration, *a*), the scion (*b*) being prepared to fit, as shown at *c*. Double-grafting on established fruit-trees of inferior quality might be largely practised, if desired, by this method.

Side-grafting in the alburnum, with an oblique or a vertical cleft, is more especially adapted for evergreens, when the operation is performed under glass in February or the latter part of summer.

Ordinary Veneer-Grafting.

This method is principally employed for propagating various trees and evergreen shrubs, either in spring or in autumn, the former preferred. The scion should be well ripened, either of the previous or current year, according to the time it is inserted, and the stock must be in a state of activity. In the evergreen scion the leaves from the top are not removed. It must be cut with an even splice-cut, about 1 inch long, and fitted on the side of the stock, previously prepared by having just the same quantity of bark—as far as the first layers of the alburnum—removed that the size of the cut portion

in the scion requires. Both parts are then fitted without a cleft or an incision being made in the wood, and, after being tied closely with a woollen or a cotton bandage, are placed in close frames, with or without grafting-wax. The stock should not be headed at first; when the parts have properly united it may be gradually removed. This method answers well for Rhododendrons.

Grafting by Approach, or Inarching.

The oldest system is thus known, and examples are frequently seen in trees growing naturally together. It was formerly practised with trees to form arches, doorways, etc., for picturesque effect, but is now more generally in use for propagating plants that do not succeed well under other methods.

The season for grafting by approach begins with the flow of sap in the spring and ends with it in autumn. The operation is performed when the leaves are on the plants forming the stock and scion, and they are allowed to remain on both for some time. The scion intended for inarching must either be a movable pot plant (as shown in the illustration) that may be taken into any place desired, or one planted in close proximity to the stock. A similar portion of wood should be removed from both the parts intended for joining, and they must be carefully fitted together and secured with tying material and a bandage.

Sometimes a tongue is cut in the plant forming the scion and made to fit into a corresponding notch in the stock at the point where the barks meet. In other methods of inarching the stock is cut off and the scion inserted on or near its point, and for restoring defective parts the terminal point of the scion is cut with a

thin edge, as for a splice-graft, and inserted where required.

Grafting by approach is much practised with Vines for obtaining fruiting wood of any particular kind in a



GRAFTING BY APPROACH.

shorter time than would be possible by ordinary propagation. Some varieties also succeed better when grafted on a stock which is more vigorous than their own. After the cut portions heal and become established the work of detaching them from their own roots and removing the branches from the upper extremity of the

stock must be very gradually performed to avoid extreme checks.

Herbaceous-Grafting.

As its name indicates, this is applicable for increasing plants when still growing, but at the same time becoming solidified and passing into an herbaceous state. The system has been applied with success in grafting the Melon on the Cucumber, the Tomato on the Potato, dwarf species of Cacti on tall ones, etc. Its chief



GRAFT OF MAMMILLARIA ON CEREUS STOCK.

advantage, however, is in the increase of resinous trees, principally Pines, by inserting grafts on the points of commoner species, which may be used as stocks.

The proper time for the operation is in May, when the young shoots are just beginning to grow, or else when growth stops and the shoots are assuming a woody nature. Stock and scion should, if possible,

be similar in texture. The former must be cut off just below the terminal buds and nearly all the leaves removed from the point thus obtained. This should be carefully split, and the scion prepared wedge-shaped and inserted rather deeply, allowing the barks to coincide, as in all other methods. Tie with worsted, cover



ROOT-GRAFTING—DAHLIA.

the cuts with grafting-wax, and shade them from sunshine by paper caps until growth is resumed.

The Walnut may be successfully propagated by terminal herbaceous-grafting, employing shoots that have not become woody for both scion and stock. These trees may also be terminal-grafted in spring, just before growth commences.

Root-Grafting.

This is practicable with many plants, either on their own roots or on those of others, and a larger stock is obtainable of such as succeed than by any other method. Good roots should be secured as stocks when the plants bearing them are in a dormant state, and the graft inserted, in most cases, when the sap begins to flow in spring. Large, fleshy roots, such as Dahlias and Tree Paeonies, should have a notch cut in a triangular form, about $1\frac{1}{2}$ inches long, and the shoot or graft similarly prepared and made to fit therein (see illustration). Other plants largely propagated by root-grafting are Bignonias, Clematis, Hollyhocks, and Wistarias. Saddle-grafting on roots is sometimes employed.

CHAPTER VI

BUDDING

THIS process consists in taking an eye or a bud attached to a portion of the bark and transferring it to another and different plant; it is an operation almost confined to woody plants, but has been practised with more or less success upon herbaceous perennials. The stock should not be budded unless the sap is in circulation, which is assured if the bark will detach itself easily when gently lifted from the wood.

There are many ways of performing the different systems, in preparing and inserting the buds, etc., and all may prove more or less successful if undertaken when the buds and stock are both in a suitable condition. The principal methods are shield, or T-budding (including the circular, square, and inverted forms), flute, or tube-budding, and annular, or ring-budding.

The first-named method, which is fully described in this chapter, is very extensively practised for propagating Roses and stone fruit. It also has come more into use for the propagation of many other fruit-trees, including Apples and Pears, especially new and scarce varieties, as the great advantage of making use of many more of the eyes, to form separate trees, is thereby attained. In large nurseries, where skilful propagators are employed, thousands of trees are annually budded, the majority of them with very successful results. It is, in most cases, preferable to

purchase established fruit-trees, as cultivators require the produce much quicker than they could get it by propagating trees themselves. The same system of budding is, however, applicable for increasing Roses, and this may be adopted with every chance of success by even a cottager if he takes the necessary care in performing the work.

Rare varieties of ornamental deciduous trees are largely propagated in this way—for instance, many of the Acers, Elms, Horse Chestnuts, etc. Evergreen shrubs, such as Rhododendrons and Hollies, are also rapidly increased in some establishments by this means.

In the case of fruit-trees, plump wood buds must be selected from medium-sized branches. On some sorts these are scarce, the majority being flower-buds, and it is rather difficult to distinguish between them at the budding season. The best time for the operation is from June to the end of August, but surrounding influences, condition of buds, stocks, etc., must be taken into account. Clean cuts, with gentle and skilful handling, are even more important in the budding of stone fruits than of Roses or other plants, and the ties should be lightly but firmly made. In all cases the operation must be performed as quickly as possible, as both bud and bark are injured if exposed to the air for any length of time.

Shield-Budding.

The most successful and generally practised system is that known as shield-budding. As indicated in the illustration, *a*, a small cross-cut is made in the bark, then another downward cut is made an inch, or less, in length, and the bark is next gently raised the full

length of the slip or cut, to enable the bud to slip down into its position easily. In preparing the bud, a piece of the growing wood of the current year's growth, with a well-formed bud, should be selected. Then pass a sharp knife from, say, half an inch below the bud to the same distance above the same, taking one-third or half the wood of the shoot with the bud. If the wood is in a proper condition to bud, the wood cut with the bud can easily be pulled away from it by gently taking the bark with one hand and the wood with the other; if the interior of the bud is torn out in the process, it is



METHOD OF MAKING
CROSS-CUT.



METHOD OF INSERTING
SHIELD-BUD.



SHIELD-BUD IN-
SERTED AND TIED.

useless, and a fresh bud must be used. No time should be lost in inserting the bud into the incision prepared for its reception, as shown in *b*, tying it round with raffia or matting, as illustrated in *c*. It is practically impossible to say what time will elapse before the bud becomes properly united, as not a little depends upon the weather; but immediately it is observed that it is swelling the bandage of raffia should be removed to allow of expansion. Unless some support is afforded to the shoots that spring from the bud, wind or other agencies are liable to cause them to become detached at the union, and all labour is lost. To prevent such

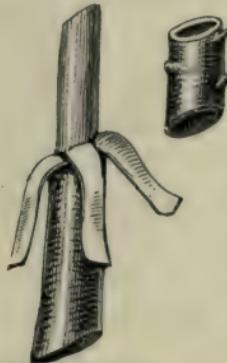
losses, young stocks of Apple, Pear, Plum, and other fruit-trees, about 18 inches high, are budded close down to the soil; only the point of the shoot is cut off when the bud is inserted, leaving a foot or so of the stock standing above the bud. When it is seen that the bud is commencing to grow, all the leaves are rubbed off the stock, and as the shoot from the bud grows it is trained and tied up to the stock, which is not cut away until the shoot has become thoroughly able to stand without any support. It may be added that thousands of fruit-trees have, in the past, thus been raised for Lord Beauchamp's tenants, and it would be difficult to equal, or at any rate surpass, them anywhere as well-grown and prolific trees, thus proving the value of shield-budding as a means of propagating hardy fruit-trees of any sort.

Square and Circular Shield-Budding consists in cutting out a piece of bark of either shape from the stock and inserting another piece of exactly the same size containing a bud and covering with a bandage or piece of sticking-plaster all except the eye. This mode is seldom made use of. *Inverted T, or Shield-Budding* is preferred in the South of France for propagating Orange-trees, but is not otherwise much used. The only difference is that the transverse incision is made below instead of above the other, and the bud inserted upwards, making it fit with the bark at the point where the stock is cut across.

Flute, or Tube-Budding.

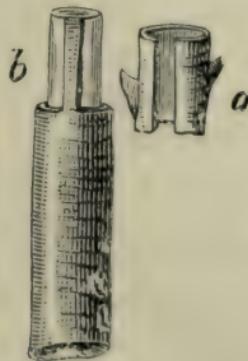
For some trees (see illustration) this is sometimes used, and answers well. A cylinder of bark is removed from the stock, and one of a similar size from the scion con-

taining buds is fitted in its place, being carefully made air-tight by means of a bandage of grafting-wax. Some prefer splitting the bark, as shown in the illustration,



FLUTE-BUDDING.

and laying it over the tube or cylinder; but the parts cannot be fitted so well as when it is removed.



RING-BUDDING.

Annular, or Ring-Budding.

By this mode it is not necessary to cut off the top of the stock. A ring of bark may be removed from any convenient part (see illustration at *b*) and replaced with

one containing eyes (*a*). The latter should be taken from a little larger branch than the stock, as the bark could then be made to fit better. As in flute-budding, air must be excluded by means of adhesive paper and bandages or grafting-wax.

Time for Budding.

Budding operations may be performed at any time during the season, but dull, cloudy weather and morning or evening are most suitable. If the branch containing buds cannot be obtained as required for use, the ends may be placed in water to keep them fresh, but unnecessary delay should be avoided.

Stocks for Budding Upon.

For the Cherry, the Wild Gean and seedlings from the Morello make capital stocks for tall trees and those of moderate growth, and the Mahaleb, or Perfumed Cherry, for small trees for pots, bushes, pyramids, or cordons. For the Plum, the Mussel, Myrobalan, Magnum Bonum, St. Julien, etc., are mostly used for stocks, and Myrobalan being best for small trees. Peaches and Nectarines are generally budded on the Mussel, St. Julien, or Myrobalan Plums; the last are best for dwarfs. The Apricot is budded on the Mussel or Myrobalan Plums for small plants, and the St. Julien Plum for standards. In France, the Damas Noir, or Black Damask, and the Cerisette are also used. They should all be raised from seeds and not from suckers. Seeds for raising plants for stocks may be sown as soon as ripe, but where quantities are used the stones are thrown into heaps so as slightly to ferment during winter. In the spring they are sown in drills or beds,

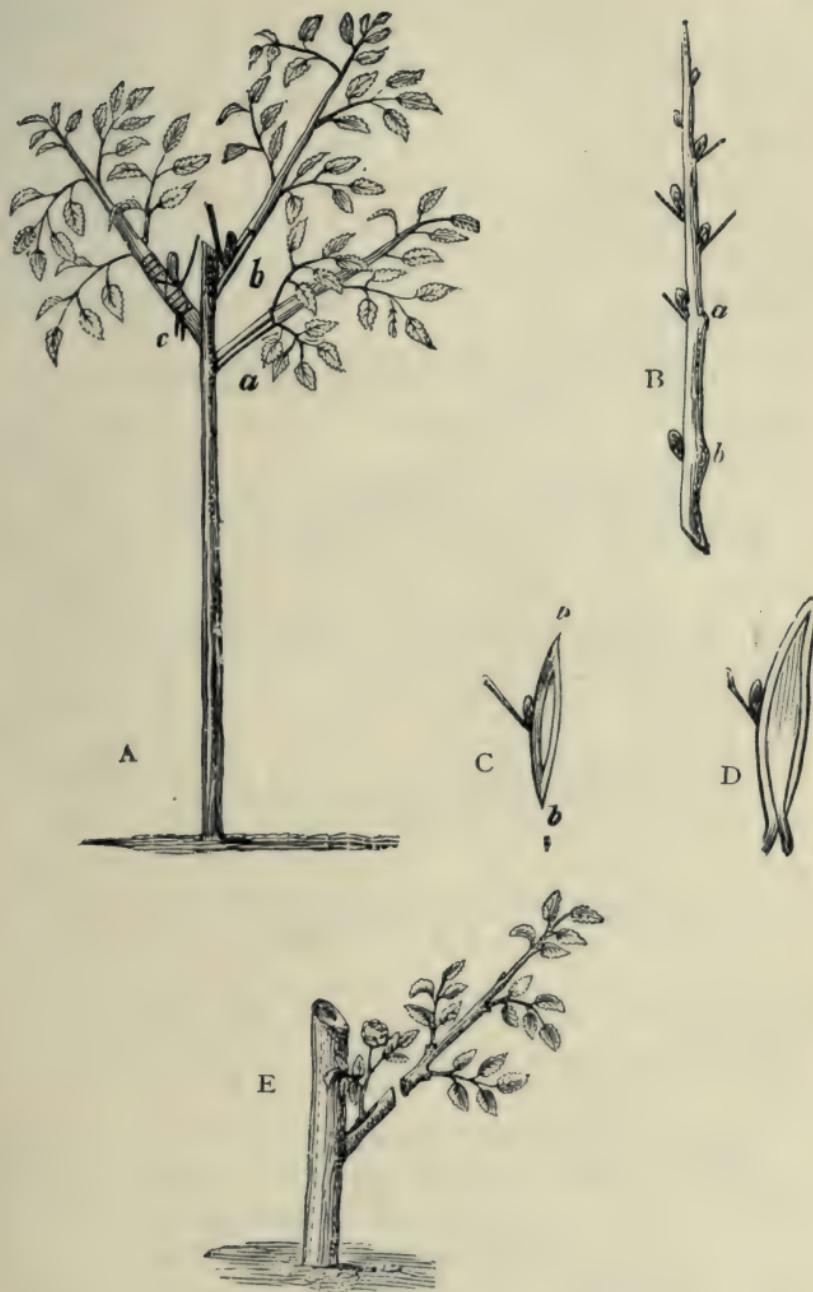
and transplanted the next year in rows 2 feet or 3 feet apart and 10 inches or 12 inches from plant to plant. The dwarfs are generally budded the second year and the standards the third or fourth. Dwarf trees are budded from within a few inches of the ground to 1 foot above; standards and riders from 3 feet to 9 feet; cordons, pyramids, etc., can hardly be budded too low.

Rose-Budding.

Propagation of Roses by budding is very extensively practised with both standard trees and dwarf plants. It is, perhaps, easier and more certain to succeed with these than with fruit-trees, but the mode adopted is precisely the same—that of the shield-shaped bud with the core or root and the bark attached. For standards the common briar of the Dog Rose is the best. The earlier these are obtained and planted in November the better, as roots are then formed at once. For dwarf plants the Manetti stock is mostly used, being easily obtained and had in proper condition almost at any time when buds are ready. Plants on this stock do not succeed in all soils, and suckers are also very liable to be produced. Budding on the seedling briar is attended with good results, and is practised more than hitherto. The De la Grifferaie stock is also used, more for Tea Roses than others, and is considered by some to produce better plants than the Manetti. The shoots on standard briars should be reduced to about three of the strongest, selected as close together as possible and near the top, the briars having been previously cut back the desired height at planting time. Two buds are sufficient for a good head, but for certainty three may be inserted. A represents a tall briar with three shoots: *a* shows

BUDDING

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ROSE-BUDDING.

the shoot slit for the bud, *b* the bud inserted, *c* the bud tied in. *B* is a branch showing buds, the lowest ones of which are most suitable, being in firmer wood. Those at the top are often useless. *C* represents a bud taken from *B*, *a*, *b*, and *D* gives an idea of how the wood is removed. As previously remarked when describing the system, experienced budders remove the wood from either end. *D* shows its removal from the lower end.

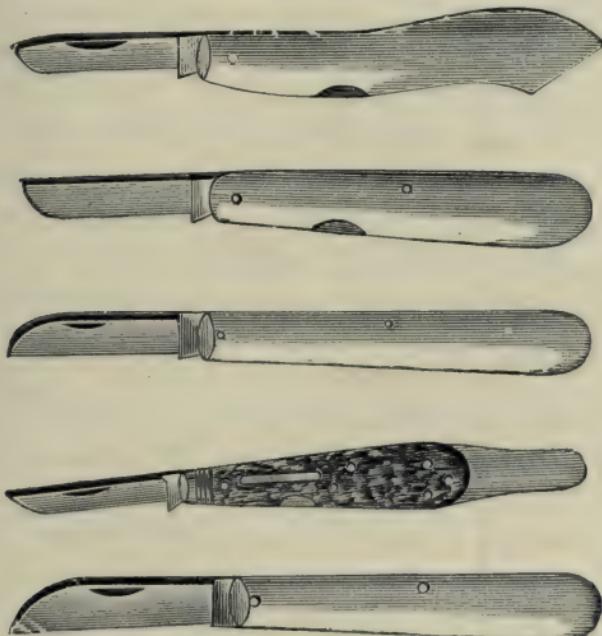
Budding as close as possible to the main stem is most desirable. Raffia is superior in every way for tying, which should be performed as soon after the bud is inserted as possible. It requires much care, and, of course, the bud itself must be entirely free. As soon as the buds swell the tying material should be loosened and the top of the stock cut back to the level of the budded shoot. By budding late the buds lie dormant till the next spring, and the necessity of tying the young shoots is dispensed with for that season. The shoots of the briar in advance of the Rosebuds must be cut back, as shown in *E*, so soon as the buds are safely established. The Manetti and other dwarf stocks are budded on the main shoot nearly close to or underneath the ground, and if low enough to cover part of the rose-stem when grown the latter often roots as well and assist the stock. Being small, they may be grown in pots and removed to the required position at any time.

Dog Roses, used for standards, are usually collected from hedgerows and sold at about 8s. per hundred. Manetti stocks are increased by cuttings, which, after making one season's good growth, will be fit for use. Briars are raised from seed, which may be collected

from hedges and sown in the autumn in drills. The seedlings should be transplanted the first year after sowing, and the following season they will be ready for working.

Budding-Knives.

The best budding-knives in commerce are those manufactured by Messrs. Saynor and Co. and Messrs.



G. Hall and Son. They are made with handles of ivory, shaped in different ways at the end for the purpose of opening the bark in order to insert the bud. Some of the blades have the edge rounded at the point, so as to cut the bark without the knife entering the wood underneath (see illustrations). Others, which may be used for budding, and are much better for general use for cutting flowers, etc., are made with the edge of the

blade carried to a point, as in ordinary knives. Another form has the handle made of some other material and a piece of ivory inserted for opening the bark. The first-named is the best, if required for budding only; the second is the most useful for ordinary purposes, and answers admirably for budding as well. None of the other shapes have any material advantages over these.

CHAPTER VII

PROPAGATING-HOUSE

IN the erection of a propagating-house, several things have to be taken into consideration, for, without a suitable house, propagation in many instances becomes a very difficult matter. The plan shown in the illustration combines several improvements. Heat, moisture, and light are essential conditions in propagation. Any kind of small house may easily be transformed into a propagating-house at a very small cost, provided heat can be obtained when wanted; but in the erection of a new house the first consideration must be to find a suitable ground through which water will drain easily. If this cannot be obtained, it would be advisable to turn the soil over to a depth of 3 or 4 feet and to put in good drainage. The situation must also be considered. It is a good plan to build the house from north to south; the east side will get the sun in the morning, and the west side in the afternoon, while the solar influence will be equally distributed in the middle of the day. The door should be made on the south end, and the boiler fixed at the north end. If the house is to stand by itself, it will be preferable to build it partly sunk in the ground, so that it will not be quickly affected by atmospheric changes; but if it has to be combined with another group of houses, it will if possible be advisable to place it between two warm ones.

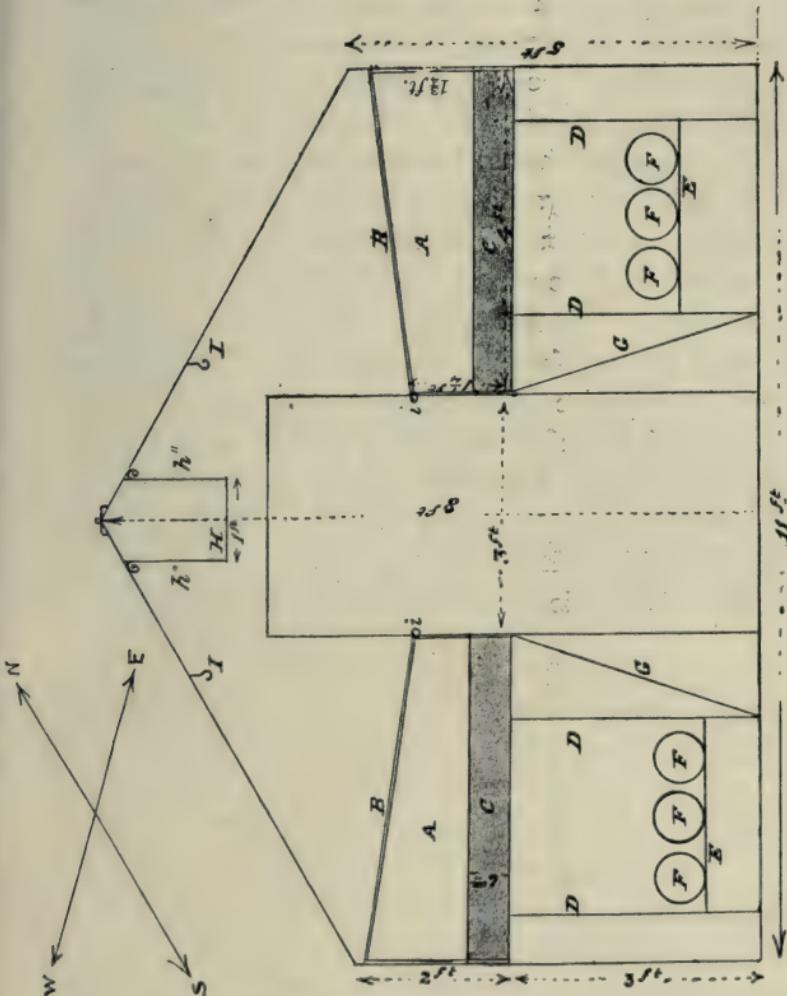
Side walls should be built with bricks. Wood only

should be used in the construction of the roof, for wood is the best insulator, while iron, with its conductive properties, is too easily affected by atmospheric influences. A few ventilators must be made on each side of the roof. In propagating-houses air is very seldom admitted at the bottom on account of all the heat being wanted for the propagating-beds.

It is preferable to have, as shown in the illustration, some hollow stages which can be closed up by the planks *G*, *G*. These can easily be made in lengths of several feet, and can be removed if not wanted. Slates should be used in the making of the stages, and no cement joints must be allowed. Water should drain through quite easily, and the heat also pass through readily to warm the propagating-beds (*C*, *C*), which may be composed of sand, coconut-fibre, sawdust, etc.

The frames (*A*, *A*) can also be easily made. Two long planks are required, one $1\frac{3}{4}$ foot wide on the back, and the other $1\frac{1}{4}$ foot on the front. They must be fixed one to the walls and the other to the stage, and between each light a transverse piece of wood will divide the two sides. The lights (*B*, *B*) are only placed on the frame, and, if they have to be removed, they can be fastened with the hooks (*I*, *I*) in the rings (*i*, *i*) on the front of the lights. During the summer, if they are not required, they can be removed altogether. A top or hanging shelf (*H*) has been drawn above the path, leaving 6 feet 6 inches. No side shelf could very well be fixed, owing to the lights, which are constantly being moved up and down. This shelf is of very great use, chiefly for pans or boxes containing plants in the course of propagation, and requiring to be placed as close as possible to the glass. Seedlings are successfully raised

on this shelf, for heat, moisture, and light are always combined there. Great attention must be given to the heating-power, for during propagating-time no fluctua-



PLAN OF PROPAGATING-HOUSE.

A, A, frames; B, B, lights; C, C, propagating-beds; D, D, iron supports for propagating-beds; E, E, supports for hot-water pipes; F, F, F, hot-water pipes; G, G, planks to block the heat under the stages; H, shelf; I, I, shelf supports; I', I', hooks to fasten lights; i, i, rings to fasten lights.

tion of temperature must be allowed in the beds. A glass thermometer must be half buried therein to be used as a guide. About 80 degrees Fahrenheit must be kept up in winter with fire-heat and moisture. This

house must also be provided with shading. Canvas is an excellent material for the purpose, and it can also be used during sharp frosts. In the spring, when the sun becomes too powerful, a second shading could be placed inside directly on the lights. Two tanks are required, one on the stage receiving heat for propagating aquatic plants, and another for watering purposes. Of course, all rain-water should be collected, and the water in the tank must always be kept at the house temperature. A larger case could also be arranged at one end of the house for big-growing plants which require a very close atmosphere. Room near to the door should be allowed for a potting-bench, for as soon as the plants are rooted they require to be potted up, and it would be very detrimental to take them into a cold place to do this. The dimensions given on the drawing indicate a very suitable house. It could easily be built 1 foot lower, thus making it easier to heat, but in most respects the illustration will be found a trustworthy guide.

CHAPTER VIII

SELECT LIST OF PLANTS

With their Means of Increase.

ABIES (Picea).—Propagation is effected principally by seed sown out of doors in April, sometimes by cuttings and by layers. The cones bearing the seeds should be quite mature when gathered. With certain kinds it is necessary to heat them in a kiln or an oven to cause the scales to open and so to release the seed. Care is necessary not to expose them to such a high temperature as would destroy the germ.

ABUTILON.—Increase by cuttings in spring in sandy soil with a temperature of 65 to 75 degrees or by seed sown in pots or pans in gentle heat.

ACACIA.—From seed sown when ripe after soaking in warm water. By cuttings of half-ripened wood in well-drained pots of sandy peat under bell-glasses in a cold frame or in heat, according to whether greenhouse or stove sorts. Some species have been reared from root-cuttings, such as *A. melanoxyton*.

ACALYPHA.—Cuttings from stock plants in heat at almost any season. Roots form most quickly in spring.

ACANTHUS.—Sow seed in gentle heat in spring, divide rootstocks in autumn. Root-cuttings also succeed if made 2 inches long and planted in pots of sandy loam.

ACER.—Seedlings may be raised from seed sown as soon as ripe or stratified and sown in spring. The

Japanese varieties are usually whip or veneer grafted on stocks of *A. palmatum*.

ACHILLEA.—These useful and much-grown flowering plants are easily increased by dividing the clumps in November or March; also by cuttings of young growths under handlights or by seed sown out of doors in April.

ACHIMENES are chiefly increased by the scaly rhizomes which are rather freely produced underground. Cuttings of young shoots strike freely in close, moist heat. New varieties are raised from seeds.

ADIANTUM.—Most of this large and beautiful genus of Ferns may be propagated by division of the crowns and rhizomes; also by spores sown on the surface of pots of fine compost covered with a pane of glass, kept moist and shaded.

ADONIS (PHEASANT'S EYE).—The annual varieties may be sown and thinly covered with soil in the outside borders in March. Perennial sorts are increased by division after flowering and by seed.

ÆCHMEA.—Suckers or offshoots are usually thrown up from the old stools after flowering. When these have attained some degree of firmness, they may be twisted off, potted into small pots, and given a little bottom heat to stimulate root action and top growth. Seedlings are very interesting to handle, but take longer to grow to a flowering size.

ÆSCHYNANTHUS.—Cuttings of firm but not hard growths, 3 inches long, will strike root in sandy compost under a bell-glass in spring if submitted to a close, moist heat of not less than 75 degrees.

ÆSCULUS.—From seed that has not been allowed to dry up and perish. Choice sorts by layers, grafting, or budding on stocks of the Common Horse Chestnut.

AGAPANTHUS.—When desirable to increase the number of these popular subjects, the old plants should be divided and repotted in March. Seed may also be sown if obtainable.

AGATHÆA (BLUE MARGUERITE).—Strike cuttings of young shoots in spring and autumn in sandy soil, with a heat of about 60 degrees.

AGAVE.—Propagate by suckers thrown up from the roots, especially after flowering.

AGERATUM.—Many are raised from seed; but in the case of some of the garden varieties cuttings are preferred, these being obtained from stock plants that have been grown in pots and not permitted to flower.

AGROSTEMMA:—Raise annual varieties from seed sown in April where intended to flower; perennial sorts by division and seed.

AILANTUS.—The so-called Tree of Heaven, with handsome foliage, can be raised from suckers, also readily from root-cuttings, 2 inches long, planted in pots of sandy soil in March. Cut-back plants produce large leaves, giving a tropical effect.

ALISMA.—These aquatics may be increased by division or by seed sown in pans in March, sunk just below the surface of the water.

ALLAMANDA.—Insert cuttings of last year's shoots with about three joints in pots of sandy soil in a temperature of 75 to 80 degrees, or young growths cut with a heel of the old wood under bell-glasses with a brisk bottom heat, affording shade from sunshine.

ALLIUM.—The ornamental flowering sorts are usually propagated by offsets, and occasionally by seed and by bulbils.

ALNUS.—Seeds of these moisture-loving trees should

be sown in a moist soil in March. Increase is also effected by suckers and cuttings. Many of the choice kinds are grafted on stocks of the Common Alder.

ALOCASIAS are propagated by division of the rhizomes in March, using a compost of fibrous peat and silver sand and placing the pots in a bottom heat of 75 degrees.

ALOE.—Plants of this extensive family of succulents are chiefly propagated by the suckers that spring up from the roots, and occasionally by seeds sown in pots of sandy soil.

ALONSOA.—The annual kinds are raised from seed sown in March; the perennials by cuttings of young shoots in a propagating-frame.

ALSTRÖEMERIA.—Divide the roots in spring or sow seed in deep pans placed in a cold frame or pit, the resulting seedlings being replanted in flowering positions the following season.

ALTERNANTHERA.—Cuttings of these strike readily in spring in a temperature of 75 degrees with bottom heat if taken from old plants that have been encouraged to sprout by increased heat and moisture.

ALYSSUM.—Sweet Alyssum may be sown out of doors in spring or in a frame. *A. saxatile compactum* may be raised from young cuttings inserted in sandy soil on a shaded border, and many of the alpine species, by division of the roots.

AMARANTUS.—The hardier sorts may be sown out of doors in April. The half-hardy kinds do well if sown on a gentle hotbed with protection from cold, to provide material for planting out late in May or early in June.

AMARYLLIS, such as the Belladonna Lily, increase by offsets which may be taken off in June and planted in a

warm, sunny position, as at the base of a hot-house wall facing south.

AMELANCHIER.—These handsome flowering trees and shrubs are propagated by layers, seed, or cuttings of ripened wood, and by grafting in March on Hawthorn or Quince stocks.

AMYGDALUS.—The Almond-trees, valued for their early flowering, can be raised from stones from the fruit planted 6 inches deep when ripe and cleaned, by grafting in March, or by budding in summer on stocks of the Bitter Almond or young seedling Plum stocks.

ANANAS.—Plants of the Pineapple family are propagated by offsets or suckers, also by crowns produced at the summit of the fruit, at all seasons, by planting in small pots of loamy soil with brisk bottom and top heat, but allowing only a moderate supply of water until roots are freely produced.

ANCHUSA.—Seed may be sown out of doors or under glass in March. These plants also grow freely from root-cuttings, 2 inches long, inserted in pots of sandy soil in a cold frame in spring.

ANDROMEDA.—The wax-like blossoms of these hardy shrubs are much appreciated. Seed should be sown as soon as ripe in pots of sandy peat, and be placed in a well-ventilated cold frame. Layering is also practised by tongueing and pegging down the shoots in September. One year is needed to develop roots sufficiently to allow of their being separated with safety from the parent plant.

ANEMONE.—Propagation of this large family is effected by seed, division, and root-cuttings. *A. coronaria* is extensively raised from seed sown as soon as ripe. The cottony down adhering to the seeds is separated by

rubbing them in dry sand, after which they may be sown on a sheltered border outside or in pans under glass, covering the seed thinly with sandy soil, which should be kept just moist. *A. japonica* and its varieties may be divided either in October or in March. Root-cuttings of this section in spring, an inch long, inserted with the tops just covered in pots of sandy soil placed in gentle heat, grow readily.

ANNUALS.—In raising these plants it is a common practice to sow the seed much too thickly together to permit of the full development of foliage and flowers. Better results are obtained when the ground has been well prepared beforehand and is in a suitable condition—moist, but not wet and sticky—at the time of sowing. If the seed is good, sow thinly, and in due course, when the seedlings appear, thin out sufficiently to allow ample space for natural growth without crowding. Keep a sharp lookout for and destroy slugs, which in some seasons are so abundant that groups of seedlings are quickly devoured by them if means are not taken to repress their invasions. Choose the proper season for sowing. Nothing is gained by doing this too early, when the ground is wet and cold and night frosts occur at intervals. On the other hand, the work must not be put off so late as to curtail the necessary time for rooting below ground and for top growth above before the hot sun and dry time of summer arrive. Half-hardy annuals sown under glass or with other protection should be gradually but well hardened off before planting in the open borders. To the tenderer annuals this applies with still greater force. Successional sowing of such kinds as may be needful to prolong the flowering season should be made.

ANTHEMIS.—These are increased chiefly by dividing the clumps. Seed may also be sown in autumn or spring.

ANTHERICUMS.—Divide the roots just after the flowering season, or sow seeds when ripe in pots placed in a cold frame or on a shelf in the greenhouse.

ANTHURIUM.—For rare and superior forms division of the roots in March is relied on. When desired in quantity, seed secured from a good variety such as *A. Scherzerianum*, sown in shallow pans of compost placed in strong moist heat, will be induced to germinate.

ANTIRRHINUM.—These deservedly popular plants may be raised by sowing seed on a warm, sheltered border in August; in gentle heat in March, to get them forward; or out of doors in April. To ensure the perpetuation of special varieties, insert cuttings in a cold frame in August.

APHELANDRA.—Seeds, when obtainable, may be sown in February or March. Cuttings of side-growths will strike root in a propagating-case or under a bell-glass with brisk bottom heat.

APHELEXIS.—Insert cuttings of firm young shoots in sandy peat under a bell-glass in greenhouse temperature during July or August.

APONOGETON.—These useful aquatic plants are most easily propagated by offsets. They may also be raised from seed sown direct from the plant as soon as ripe in pots of loam, to be then submerged just below the surface of the water.

APPLE.—Pips that have been stored in sand may be sown out of doors in March for new varieties. Approved sorts are now principally increased by budding in July

and August or by grafting in March on Crab or Paradise stocks. (See Budding and Grafting, pp. 44 and 62.)

APRICOT.—These are mostly budded early in June on seedling Apricot and Plum stocks. The stones may be sown when ripe, 2 inches deep, and covered with a layer of litter during winter. The resulting young trees may be lifted, and after trimming the roots be replanted, when a year old.

AQUILEGIA.—These popular and favourite plants should be raised from seed sown soon after ripening in a cold frame, and select varieties propagated by division of the roots.

ARABIS.—Increase by division or by cuttings in August under handlights with shade from sun until rooted.

ARALIA.—Many of these ornamental foliage plants propagate readily from root-cuttings, 2 inches long, in pots of sandy soil, covered with a pane of glass and with a moderate bottom heat. The stems, if cut into eyes and similarly treated, will also provide plants. Stove kinds, like the handsome *A. elegantissima* and *A. Veitchii*, do not yield to such easy treatment, but are grafted low down on stocks of *A. Guilfoylei* and *A. reticulata*, and kept in the close propagating-case until union is effected.

ARAUCARIAS.—These graceful Conifers are mostly raised from imported seed sown in gentle heat soon after arrival, but are often slow in germinating. The pretty *A. excelsa*, used so extensively for decorative purposes, is reared from cuttings obtained from stock plants grown for the purpose of providing suitable material. These are firmly fixed in small pots of sandy compost, using pegs when necessary to keep them from shifting, and are then placed in a cool house, shaded and

syringed until roots are formed, and in due course repotted into a more substantial compost.

ARISTOLOCHIA.—The stove and greenhouse species of this remarkable and curious genus may be propagated by cuttings of side-shoots of young growths, 6 inches long, taken off with a heel and inserted at once in pots of sandy compost, then placed in a bottom heat of 75 degrees in a propagating-case or under bell-glasses. Hardy sorts may be layered or raised from seed.

ARTEMISIA.—These plants, valued for their ornamental appearance or for their economic properties, are increased as follow: the shrubby kinds by cuttings and by division, herbaceous sorts by division, and annuals by seed.

ARTICHOKE, CHINESE (*Stachys tuberifera*).—The tubers obtained from growing plants annually keep up a good supply without resorting to other means.

ARTICHOKE, GLOBE (*Cynaria scolymus*).—These are often raised from seed sown in March or April, but suckers taken off with a heel from the old shoots is the best means of perpetuating approved varieties.

ARTICHOKE, JERUSALEM (*Helianthus tuberosus*).—This plant is prolific of tubers which, whole or cut into eyes, grow so readily in any ordinary soil when planted in either autumn or spring that multiplication is easily ensured.

ARUM.—These interesting and curious plants, sometimes of offensive odour when in blossom, are generally propagated by dividing the roots when growth is about to commence in spring. The berries may also be stratified in sand to keep them fresh, and be sown in March.

ARUNDO.—These noble grasses may be divided in spring or raised from seed sown at the same period.

ASCLEPIAS.—Hardy kinds are multiplied by seed and by dividing the roots in spring; stove and greenhouse ones by cuttings in heat under bell-glasses.

ASPARAGUS.—The ornamental foliaged stove and greenhouse sorts may be raised from seed when obtainable, which should be sown in heat soon after it ripens. In some cases layering is adopted, as also is division of the roots. The best time for the latter operation is just as growth is about to commence. The culinary asparagus is successfully raised from seed sown 1 inch deep in drills 1 foot apart in April.

ASPERULA.—These neat and sweet-scented plants are increased by seed sown in April, and the perennial sorts by division of the roots in March.

ASPIDISTRA.—These are generally appreciated as easily grown room and window plants, and may be increased in number by dividing the old plants when repotting in March.

ASTER.—Propagation of these useful plants is easily carried out by dividing the rootstocks in autumn or early spring. Seeds may also be sown in spring, while cuttings also strike root readily if young growths are selected and covered with a handlight, very little if any heat being needed to ensure success.

ASTILBE.—These are best propagated by dividing the clumps and planting them in rich, moist soil in April.

AUBRIETIA.—Slips and cuttings inserted in a shady border or seed sown in June soon make good plants. Long, slender shoots are sometimes layered and covered with soil after the flowering period, at which time the roots may be divided.

AUCUBA.—Seeds obtained from the berries grow

readily if sown in a cold frame just after ripening. Cuttings of firm but not hard shoots root freely if planted in sandy soil in a cold frame or a sheltered border in autumn. Standards and choice varieties are sometimes grafted on stocks of the common kinds under glass.

AURICULA.—Offsets soon establish themselves if taken off in February and planted round the edges of small pots and covered with a bell-glass. Water should be administered sparingly, air admitted, and this latter gradually increased when growth commences, to be followed by potting off separately into small well-drained pots. When saving seed great discrimination is exercised by the best growers in the selection of parents. The seed is sown as soon as ripe in pots of sandy soil that has been watered and stood for a short time to drain. It is then lightly covered with a sprinkling of coarse sand, the pots are stood in a cold frame or a greenhouse and covered with a pane of glass. The seedlings often appear at irregular intervals, and the late comers are often the best. When large enough to handle, they are pricked off into pots of sandy soil, and afterwards inserted in thumb pots.

AZALEA.—The successful propagation of Azaleas requires considerable care and practice, and is generally entrusted to the professional who has acquired by experience the necessary knowledge and has the proper convenience at hand. Large numbers are imported annually from the Continent, where special attention is devoted to their increase. Hence young plants well set with buds are generally purchased and, if properly treated, they grow and increase in size and last for an indefinite time.

Seedlings of the hardy Azaleas are raised by sowing the seed as soon as ripe in well-drained boxes filled with sifted peat and sand in cold frames, lifting and transplanting in the following autumn. Cuttings of half-ripened shoots, 2 or 3 inches long, taken off with a heel in August, inserted in sand and peat, if placed in a cold frame until callused, then given a gentle bottom heat, generally root fairly well. Layering by notching and pegging branches down in March is an easy method, but two years elapse before sufficient roots can be detached from the parent plants with safety. Splice-grafting on stocks of *A. pontica* under glass is the method mostly practised with choice varieties. The greenhouse varieties of *A. indica* can also be raised from seed and cuttings, but are chiefly splice-grafted in winter on stocks of a robust-growing kind, such as the common white, *A. indica alba*, and placed under bell-glasses or in a close case in the propagating-house in a temperature of 65 degrees until union is effected.

BAMBUSA (BAMBOOS).—These ornamental Gramineous plants are propagated by carefully dividing the rootstocks in March and April just as growth is about to commence. They are most successful when potted and given moderate warmth under glass until re-established.

BARTONIA.—*B. aurea* is a pretty golden-flowered annual. It thrives best when seeds are sown on a sunny border in April where intended to flower, as the seedlings do not transplant well.

BASIL, SWEET (*Ocimum basilicum*).—This useful flavouring herb is raised from seed sown under glass in April to provide plants for planting out in May and June.

BEANS, BROAD.—For the earliest crop sow the seed in

a sheltered situation in November, and again in March and April for the main crop and succession.

BEANS, FRENCH OR DWARF KIDNEY.—For the first outdoor crop sow on a warm, sheltered, sunny border in late April or early May, and make successional sowings in June.

BEANS, RUNNER.—Sow in an open sunny position late in May, so that the young seedlings may not appear too early to suffer damage from spring frosts.

BEETROOT.—The most approved time for sowing this crop is late in April or early in May, according to the locality and season. If the seed is steeped for a few hours in water before sowing, germination is more speedy.

BEGONIA.—Different means are adopted for the propagation of these plants, owing to the sections in which they are divided and the divergent habit of growth. The tall-growing, shrubby kinds, such as *B. fuchsioides*, are readily propagated by cuttings in close, moist heat, inserted in pots of sandy compost covered with a thin layer of silver sand.

Tuberous-rooted kinds are most successfully raised from seed, but to perpetuate special sorts true to name it is advisable to strike cuttings in the propagating-case with a close atmosphere and bottom heat.

Seed-Sowing.—Begonia seed is extremely small, resembling dust, and must not be covered with soil or it will fail to grow. Take some clean 6-inch pots, drain them with clean potsherds to one-third of their depth, and cover with a thin layer of moss. Fill up to within $\frac{3}{4}$ inch of the rim with equal parts loam, leaf-mould, and silver sand that has been sifted through a $\frac{1}{4}$ -inch sieve, press it down slightly, and make the surface level and smooth. Let it have a good soaking with a fine-rose watering-

pot, allow to drain for an hour ; then sow the seed thinly, give the lightest sprinkling of sand, plunge the pots to two-thirds their depth in a bottom heat of 60 to 70 degrees, cover each with a sheet of glass, and this, again, with a sheet of paper to exclude light. Remove the glass every morning to dry off condensed moisture. As soon as signs of growth appear, remove the paper, but at all times shade from sunshine, and gradually increase ventilation by tilting the glass until it is altogether removed. Should the soil need moistening, immerse the pot nearly to the rim in water, but do not use the watering-pot overhead. Prick out separately or in tiny batches early ; in due course pot off separately into small pots, and grow on in a position near the glass to keep them sturdy in a temperature of about 70 degrees. During winter the roots may be stored in dry coconut fibre or sand.

Foliage Begonias of the *Rex* section may be raised from seed to obtain new varieties. The method of increase usually practised is as follows : Fill well-drained pans with sandy compost, then cut off some mature leaves, shorten the leaf-stalks and insert them in the soil with the blades of the leaves spread flat on the surface, cutting through the thicker veins. Put a stone or potsherd wherever required to weight the leaves down to the soil and keep them from moving ; then place in a warm, moist heat of 75 to 85 degrees, and afford shade—indeed, this section delights in shade. Young plants grow from wherever the veins of the leaves have been cut, and when of sufficient size may be put separately into small pots and treated as seedlings.

Autumn and Winter Flowering Begonias of the *Socotrana* race are by some raised by inserting leaves singly

in small pots in February, but more generally by striking cuttings of the young shoots when the old plants start into growth. The variety called John Heal (named after the raiser, who has enriched our gardens with many excellent hybrid flowers), Gloire de Lorraine, and many others belonging to this section, are highly valued for producing abundant blossoms at a season when such are much appreciated.

B. sempervirens.—If seed of these be sown in heat in February and the resulting seedlings grown on in a congenial temperature, they will supply suitable plants for planting out in June.

B. manicata, a favourite old Mexican species, and others of similar habit, are easily propagated by offsets from the rhizomatous stem.

BERBERIS.—These ornamental flowering and berry-bearing plants can be raised from seed cleaned from the pulp and sown in autumn, or from that which has been stratified in moist sand through the winter and sown in spring. Other methods are by suckers, by layers put down in October, and by cuttings of ripened shoots inserted in a cold frame in September.

BIENNIALS are successfully treated by sowing hardy kinds in July or August for flowering the following season. Some perennials that flower most profusely the second year from seed, such as Foxgloves, Sweet Williams, and Wallflowers, are commonly given the treatment of biennials.

BIGNONIA.—These handsome flowering climbing plants are propagated by firm cuttings of the side-shoots, about 3 inches long, inserted in pots of sandy compost in the propagating-case or under a bell-glass with a temperature of 70 degrees. The glasses should be wiped each

morning to prevent too great an accumulation of moisture. Layering also succeeds.

BOCCONIA.—Cuttings of side-shoots will root under bell-glasses in a temperature of 55 degrees. Suckers and division are other means much resorted to.

BORAGE (*Borago officinalis*).—Seed of this herb (used in beverages and a good bee-flower) should be sown in a sunny position in March.

BORECOLE.—Both the culinary and the ornamental foliaged sorts should be sown at the end of March, or in April for the main crop.

BORONIA.—The species of this genus of greenhouse plants, esteemed for their handsome or their sweet-scented flowers, require care in their propagation. Cuttings of rather firm young shoots should be inserted in a compost of loam, peat, and sand, surfaced with a thin layer of pure sand and covered with a bell-glass, with careful watering, in a cool house.

BOUGAINVILLEA.—These can be raised from root-cuttings, but the usual course is to select short-jointed, half-ripened cuttings of side-shoots, taken off with a heel of the older wood, and to place them in a brisk bottom heat in a close, warm case.

BOUVARDIA.—Root-cuttings grow readily if inserted in pots with warmth in spring. Bouvardias are also extensively increased by cuttings of young shoots, 2 inches long, which are obtained in plenty from old plants that have been cut back and encouraged to sprout with increased heat and moisture. It is not necessary to cut them at a joint. After inserting them in pots of compost with a layer of sand at the top, they are kept in a close, warm frame until rooted.

BRACHYCOME.—The Swan River Daisy is a popular

and showy flower. The seed may be sown indoors in March, to transplant on sunny borders outdoors in May, or be sown in the open at the end of April where the plants are intended to bloom.

BRIZA.—These ornamental Grasses, useful both in the fresh and in the dried state, grow readily from seed sown in April in loamy soil.

BROCCOLI.—Sow in a frame in March and outdoors in April and May for succession.

BROMUS.—Ornamental Grasses used similarly to Briza, and should be similarly treated.

BROWALLIA.—These greenhouse annuals grow readily from seed sown in the greenhouse in March, potting them on as they require more root room.

BRUSSELS SPROUTS.—Sow under glass in March for the early crop, and for the general crop outdoors in the same month.

BRYOPHYLLUM.—This curious subject, noted for producing young plants from the notches at the margins of the leaves, is readily increased if the leaves are laid flat on moss or sand in a warm, moist atmosphere.

BUDDLEIA.—The different species of these handsome free-flowering shrubs are easily raised from seed, and by cuttings of firm, short-jointed shoots planted in sandy soil in September in pit or frame from which frost is excluded.

BUTOMUS (FLOWERING RUSH).—This popular aquatic flowering plant is best increased by division in March and April.

BUXUS (Box).—These are propagated by seed sown as soon as ripe; by cuttings of young shoots, 4 inches to 6 inches in length, firmly planted in a shady situation in September; by layers put down in October; and by

division in October or March. Box edgings are made by taking up old plants, dividing the growths with roots attached to each piece, and planting the latter in a shallow trench, making the soil firm about the roots. The best month for the operation is March.

CABBAGE.—This useful vegetable for spring use should be sown out of doors in August; for summer and autumn crops from March till May; Red Cabbage for pickling, in August.

CACTI.—Species and varieties of the different genera of this family are propagated by seed, cuttings, division, offsets, and grafting. Cuttings are very easy to root if the cut portion is exposed to the atmosphere for a day or two to dry before planting. Even large plants, when they become too tall, may have a few feet cut off the tops. After the cut surface has dried, if planted they soon emit roots and grow if the soil is only kept just moist.

Grafting.—As the delicate-growing kinds are apt to decay at the base in our sunless winter season, and thrive better if grafted on stems of more robust-growing species, some are occasionally grafted to add to their already grotesque and quaint appearance. Standard Epiphyllums are obtained by grafting. The stocks are provided by cuttings of *Pereskia aculeata*, which root and grow readily. In September they are headed down to the desired height and scions of Epiphyllum about 6 inches long are taken, a thin slice being cut off both of the flat sides to form a wedge. The stem of the stock is then split with a sharp knife, the wedge-shaped scion inserted and secured by thrusting a pin through. The grafted plants are then placed in a close, warm propagating-case, kept moist and shaded in a temperature of about 75 degrees until a union is effected. Downward

slits may also be made at intervals in the stem, and pieces of *Epiphyllum*, cut wedge-shaped at the base, inserted and secured from moving either by binding with raffia or by thrusting a *Cactus* thorn or a pin through both stem and scion. Neither clay nor grafting-wax is needed. *Cereus flagelliformis* (Rat's-tail Cactus) is often grafted on the *Pereskia* to form drooping specimens. Grafting Cacti is a very simple and generally successful operation if carried out during the period of growth, when the sap of both stock and scion is in motion.

Raising from Seed.—This is a most interesting operation on account of the peculiar changes of form assumed in the different stages of growth, so completely unlike anything in ordinary seedling plants. Of late years many very handsome-flowered *Phyllocacti*, with a wide range of the most beautiful and delicate colours, have been raised by careful hybridisation. The seed will germinate in from two to four weeks if sown in the spring in well-drained pots of sand and loam covered with a very thin sprinkling of finely-sifted soil and with a pane of glass on top until the seedlings appear. The pots should be plunged in a bottom heat of 75 to 80 degrees in a warm house. Plant separately in small pots when large enough to handle, and in the following winter supply only just sufficient water to prevent shrivelling.

CALADIUM.—Increase by dividing the tubers in spring. The tubers may also be cut to single eyes when starting into growth. Dust the cut portions with finely-powdered charcoal to prevent decay, then pot them separately into small pots, place in a brisk heat, and keep the compost only slightly moist until growth is active.

CALCEOLARIA.—Seeds of the herbaceous Calceolarias should be sown on the surface of well-drained pots or pans of compost (as directed for Begonias) in July in a shady part of greenhouse or cold frame.

Shrubby Calceolarias, used largely for bedding, are propagated in October by cuttings planted in beds in cold frames but protected from frost during winter with straw or Russian mats and transplanted in spring. No artificial heat is needed.

CALLICARPA.—*C. purpurea*, raised from seed or cuttings, produces a good display of purple berries if the growths are allowed to extend without much pinching back in an intermediate house temperature.

CALYCANTHUS.—These sweet-smelling shrubs are propagated by layers put down in July and August.

CAMELLIA.—The single-flowered and hardy sorts may be propagated by seed, layers, and cuttings of partly-ripened shoots kept in cold frame until callused, then removed to a heated pit. Choice greenhouse sorts are mostly side-grafted without tongueing from July to September on stocks raised from cuttings of the old single red and placed in a heated propagating-case until a union is effected.

CAMPANULA.—Species and varieties of this numerous family are propagated by seed, cuttings, and division. The habit of growth will be a good indication of the most suitable method. *C. pyramidalis* for pot culture should be sown in March to provide plants for flowering the following year. The popular Cup and Saucer (*C. calycanthema*) and Canterbury Bells (*C. medium*), if sown in May, will also supply good material for a display the following year.

CANDYTUFT (*Iberis*).—Propagate the perennial sorts

by cuttings under handlights or in a cold frame in July; annual kinds by seed sown on a sunny border from March to May where the plants are intended to bloom.

CANNA.—The seeds of these are so extremely hard that they germinate very slowly unless steeped in warm water for about 24 hours before sowing, or the outer shell may be chipped or filed through to admit moisture to hasten the sprouting. The young roots being very brittle, it is recommended that they be sown singly in small pots to avoid damage by breakage, which might happen if sown in pans many together. From 70 to 80 degrees is a suitable heat for raising them. Named varieties are increased by division in spring when growth is commencing.

CAPSICUM.—The different varieties are ornamental on account of their bright-coloured fruits; they are also useful for culinary purposes. Sow in February and March in heat.

CARDOON (*Cynara cardunculus*).—This vegetable is much esteemed in some countries, but only occasionally grown here. The seeds are best sown singly in small pots placed in a cold frame at the end of April, planting out in trenches in May. In warm localities seed may be sown outdoors in the trenches in patches of three, the patches being 18 inches apart. When the seedlings grow, select the best plant in each patch and destroy the others.

CARNATIONS.—*Marguerite Carnations* may be sown indoors in February and planted out in April to bloom in August.

Perpetual or Tree Carnations are propagated from January to March from side-shoots, 3 or 4 inches long, taken off by gently pulling them downwards so that

they have a heel, as such are quicker in striking. Some use pure sand, others a sandy compost with leaf-mould and loam. If sand alone is used, the cuttings, when rooted, should be potted into compost, or they will soon weaken. They require bottom heat in a close case or under a bell-glass, and will root in from four to six weeks ready for potting off singly in small pots.

Border Carnations are mostly propagated by layering in July and August. Have in readiness the required compost—loam, leaf-mould, and sand in about equal parts sifted through a $\frac{3}{4}$ -inch sieve—also sufficient wire or other pegs ready prepared. The lower leaves are then stripped off each shoot, either by pulling them downwards or trimmed off with a pair of scissors, and the surface soil around the plant is loosened with a hand-fork. An incision is next made with a sharp knife just below a joint on the underside, and carried upwards through and a little above the joint. Some of the new compost is spread around, into which the prepared shoots are pegged down, being careful to keep open the slit formed by the incision, and then cover with about an inch of compost. If kept constantly moist, the layers will root in from four to six weeks and be ready for potting up or planting out where they are intended to be grown. (See illustration, p. 26.)

Raising Carnations from Seed.—Good strains of seed are obtainable, from which both single and double flowers result. If sown in gentle heat in May, the seedlings will be sufficiently advanced for planting out in their permanent positions by the end of September.

CARROT (*Daucus carota*).—Sow Early French Forcing and Short Horn varieties on a gentle hot-bed, protected with a frame, early in February, and make successional

sowings on a dry, well-sheltered border in March. Sow the main crop in sandy soil in April in drills 12 inches apart.

CATALPA (*C. bignonioides*).—A handsome flowering-tree for the lawn is raised from imported seed sown in spring, also by layers and cuttings of ripened shoots in autumn. Root-cuttings are also used.

CAULIFLOWER.—Sow in August or early in September for protection under handlights in winter for spring and early summer use, in February and March on gentle hot-bed, and for succession in April and May outdoors.

CEANOOTHUS.—These handsome blue-flowering shrubs and wall plants are propagated by layering strong shoots in October and by ripened cuttings in a cold frame in autumn.

CEDRUS.—These coniferous trees are raised from seed fresh from the cones, sown in pans of loam in a cold frame.

CELERIAC (TURNIP-ROOTED CELERY).—Sow in gentle heat in March.

CELERY.—Sow on a mild hot-bed or in gentle heat for early crop in March, for main crop at end of April. Prick out 4 inches apart when big enough to handle, and harden off by giving free ventilation before planting out.

CELOSIA.—The Common Cockscomb and plumose kinds should be sown in March in pots or pans of sandy soil, and placed in a steady bottom heat in a moist atmosphere of 65 to 70 degrees.

CELSIA.—The hardy biennial and annual kinds may be sown under glass in spring or on an open sunny border in June. *C. Arcturus*, so successfully used as a pot plant in greenhouses, strikes freely from cuttings of young wood in pit or frame.

CENTAUREA.—This genus includes the popular Corn-flower, Sweet Sultan, several hardy perennials, and the extensively-grown, silvery-leaved *C. Cineraria*. The perennials can be raised from seed, or the roots may be divided; the annuals from seed sown in April. For bedding purposes *C. Cineraria* is much more satisfactory, and is considerably less trouble when raised from seed sown in slight heat in August, than when propagated from cuttings, as was formerly practised, provided they are potted singly in small pots and kept in a cool house from which frost is excluded during winter.

CERASTIUM.—The silvery-foliaged kinds, so useful in the rockery and for edgings, are easily increased by division in April or by cuttings planted in a shady border after flowering in July.

CESTRUM (*Habrothamnus*).—Cuttings of young side-shoots with a heel strike root freely in a close heat of 65 to 70 degrees in summer.

CHAMÆPEUCE.—Much used in sub-tropical gardening and carpet-bedding, these composites are raised from seed sown in gentle heat in February and again in September. In the latter case the seedlings are protected indoors during winter to provide strong plants for planting out of doors at the end of May.

CHERRIES.—These useful fruit-trees are mostly budded in July on stocks of the Wild Gean raised from seed and the Mahaleb stock for Morello Cherries and dwarf trees. Should any of the buds fail to take, grafting may be done in March. Prospects of success are greatly enhanced by cutting off the shoots intended for scions early in the year, laying them in the ground in a cool place to keep them dormant until wanted. A wood bud is necessary on each scion, and it sometimes

happens that this only occurs at the extremity. In such cases it should not be cut off.

CHERVIL.—Sow the curled variety for salads and garnishing in March and at intervals of six weeks for succession. A shady north border is best for the summer crop, as it does not then run so quickly to seed.

CHICORY.—For blanching and for use as a salad in winter, Chicory should be sown in May or June in drills 1 foot apart.

CHIMONANTHUS.—A favourite sweet-smelling flowering shrub, propagated by layering branches in the autumn.

CHIONODOXA.—These are usually increased by offsets or seed sown as soon as ripe outdoors.

CHIVES.—Divide the clumps in autumn or spring, and plant small bunches in rows 1 foot apart, or sow seed $\frac{1}{2}$ inch deep in April.

CHLOROPHYTUM.—The variegated variety used in summer bedding is propagated by offsets and division of the roots in spring.

CHORIZEMA.—By seed sown in a compost of peat, loam, and sand in a warm house in March is the most certain method. Cuttings of young wood taken in spring will strike root, with care, under a bell-glass.

CHRYSANTHEMUM.—The much-grown varieties of *C. indicum* are mostly propagated by stout cuttings from the base—which spring up after flowering from October to May—in a close cold pit or with a little warmth in winter, gradually admitting air when signs of rooting are noticed. Suckers with roots are sometimes preferred for growing into standards. These only require to be planted singly in small pots and to be placed in a cool, well-ventilated position near the glass to keep them sturdy. The tops of the Japanese varieties taken off in

April and May can be struck to produce dwarf plants on single stems for flowering in small pots for decorative purposes. They root readily in a cool, close frame. The stools of outdoor plants can be easily increased by division in February or March.

To raise new varieties the seed should be sown in January or February in gentle heat, and, when potting off, weak as well as robust seedlings should be grown on, as sometimes the former give better results than the more vigorous. The true characters of the blossoms are not shown until the second year, at which time their merits may be decided, those of promise being retained and the worthless discarded, but not before.

C. frutescens.—The Marguerites, or Paris Daisies, are propagated by cuttings of healthy, firm shoots taken in autumn and spring in a close frame or under bell-glass until rooted. The annual kinds of *C. carinatum* and *C. coronarium* may be raised from seed sown under glass in February or outside at the end of March. There are many beautiful varieties.

CINERARIA.—The greenhouse varieties should be sown in May and July in pans of sifted compost consisting of loam, leaf-mould, and sand in equal proportions, thinly covering the seed. Put over them a sheet of glass and place in the greenhouse or pit, raising the glass to admit air when the seedlings appear, and finally removing altogether. When large enough to handle, prick out in pans or boxes or separately in small pots. In summer grow on in a cold, well-ventilated frame with a cool, moist bottom of coal ashes, and remove to the greenhouse in October to protect from frost.

To perpetuate the good qualities of double varieties they are propagated from cuttings.

The silver-leaved kinds used for bedding are mostly raised from seed sown in gentle heat in February or March to plant out in May; also by cuttings of side-shoots in spring and autumn in a close frame with slight bottom heat, no water being applied over the foliage owing to their liability to damp off otherwise.

CISSUS.—Propagate in spring. When the young shoots have grown a couple of inches long, cut them smoothly with an entire piece of the old wood just below a joint, insert in pots of sandy peat, plunge in bottom heat, and cover with a bell-glass in a temperature of 75 to 85 degrees.

CISTUS.—These are reared from seed sown early in spring with gentle bottom heat, also by cuttings, 3 or 4 inches long, inserted firmly in sandy peat and covered with a handlight either in spring or autumn, with, of course, shade from sunshine.

CITRUS.—The Orange family are chiefly propagated by budding, grafting, or inarching on seedling stocks raised from lemon or orange pips. August is a good time for the budding operation, and the worked plants are placed under handlights or in a close case with a bottom heat of 85 degrees. Either side- or splice-grafting is done in March. Inarching is effected whenever the branches are sufficiently firm, but not hard, and when the union is complete the parent is by degrees cut through until completely severed.

CLEMATIS are principally propagated by grafting on fleshy roots of free-growing common species, such as *C. Vitalba* and *C. flammula*. The roots with some fibres attached are cut into lengths of about 5 inches, split at the upper end, and a wedge-shaped scion is inserted and tied with raffia; they are then potted and placed in

the warm, moist atmosphere of a propagating-case. When united they may be gradually hardened off until fit to plunge in a bed of ashes outside. Layering also succeeds if young shoots are put down in summer and covered with soil until rooted sufficiently to be severed from the parent. Cuttings of young shoots will strike in gentle heat in a propagating-case, and seeds can also be raised when procurable. The herbaceous kinds are increased by division and seed.

CLERODENDRON.—The methods of increase are by cuttings of ripened wood and side-shoots, root-cuttings, and seed. *C. fallax*, sown in April in heat and grown on without check, will produce large heads of scarlet blossoms in autumn; root-cuttings will also grow readily. The hardy Japanese *C. trichotomum* can be rapidly increased early in spring by fleshy root-cuttings, 3 or 4 inches long, dibbled upright (tops uppermost) in sandy compost, with the tops just covered, and placed in a cold frame.

CLIANTHUS.—The Glory Pea of Australia, *C. Dampieri*, can be easily raised from seed, but the plants are very fastidious; they sometimes grow with vigour, appear robust and healthy one day, and the next, for some unknown reason, will be in a pitiful, drooping state, from which they never recover. Very healthy and beautiful specimens have been obtained by grafting on young seedling stocks of *Colutea arborescens* (Bladder Senna). Seeds of the *Colutea* are sown singly in small pots in spring. Three weeks later seed of *C. Dampieri* are sown, and when the first true leaf appears they are in the right stage for scions, which are side-grafted and tied tenderly with raffia. They are then placed in gentle bottom heat in the propagating-house and covered with

a bell-glass until a union is effected, being gradually hardened off and inured to full exposure of the air and the greenhouse. *C. puniceus* will strike and grow freely from cuttings plunged in bottom heat until rooted.

CLIVIA (*Imantophyllum*).—These handsome greenhouse and window plants are increased by division when repotting and by seed sown in March in a temperature of about 75 degrees.

COBÆA.—The green-leaved kind is reared by sowing new seed in gentle bottom heat in March, the variegated variety by cuttings of young shoots when they break into growth in spring, either being covered with a bell-glass or plunged in slight bottom heat in a close case.

COLEUS.—Old plants that have been preserved through the winter in a warm greenhouse will supply suitable shoots for cuttings in March; they should have the bottom leaves removed, be cut through just below a joint, inserted in pots of loam, leaf-mould, and sand, plunged in bottom heat in a close, warm frame until rooted.

COLEWORTS.—These prove of value for early use as immature Cabbage if sown in July and the seedlings planted in ground cleared of other crops.

COLLINSIA.—Favourite annuals which should be sown in the open border in March or April and be thinned out to about 2 inches apart.

CONIFERS.—These are mostly reared from seed sown in pans of compost placed in a cold frame about March. Many, such as *Cupressus*, *Juniperus*, *Retinosporas*, *Thuias*, *Cryptomerias*, and *Wellingtonias*, can be successfully raised from cuttings of side-branches, 4 to 6 inches long, firmly planted in sandy, well-drained soil, with a thin layer of pure sand on the surface, in

September on a shady north border covered with a frame or handlights or in pots in cold frame until callused, then placed in gentle bottom heat to assist root formation. With some species side-grafting is also practised on 2-year-old stocks placed in a close frame, ventilating for an hour each morning to dispel excessive moisture.

CONVOLVULUS.—The dwarf and climbing kinds so much grown in gardens should be sown in April in a sunny position where they are to flower.

COREOPSIS.—Sow seeds of annual kinds outside in April. Propagate perennial kinds by young cuttings in a cold frame in summer or by division of the roots in autumn or spring.

COSMOS.—Sow seed in gentle heat in March to plant out in May.

COTONEASTER.—Propagate by seed sown in spring, also by cuttings under handlight and layers put down in autumn.

COUVE TRONCHUDA (PORTUGAL CABBAGE).—Sow seed in March or April on open border.

CRASSULA (Rochea).—*C. jasminea* is an excellent market plant. It can be propagated by cuttings in spring and even more easily by pulling old plants to pieces after flowering and planting stems from which roots are already growing.

Cuttings of the old favourite, *C. coccinea*, should be made from non-flowering shoots with the lower leaves removed, slightly drying the cut portion by exposure to sun and atmosphere before inserting them in June, standing the pots on a greenhouse shelf and watering sparingly until rooted and making growth.

CRATAEGUS.—The haws should be collected when fully

ripe and stratified for a year (as described in the article on "Stratification") before sowing. The choice kinds which cannot be relied on to come true from seed are budded or grafted on stocks of the Common Hawthorn.

CRESS, GARDEN.—In winter and early spring sow seed on the surface of boxes filled with ordinary sifted soil made level and watered, but do not cover the seed. Cover the box with a pane of glass. This Cress will grow outdoors in summer.

Watercress is best grown in shallow running water that does not become frozen. Young shoots planted in gravelly soil soon become established, and the more the tops are cut in reason the more they branch and grow.

CRINUM.—Seed will grow readily if sown singly in small pots as soon as ripe, but a long time must elapse before flowers are produced. Offsets planted in moderately rich soil come earlier to perfection.

CROCUS.—These are mostly increased by offsets from the old corms. Seedlings raised from seed sown in a cold frame and afterwards planted out may be expected to blossom in three or four years.

CROTON (*Codiaeum*).—These excellent, fine-foliaged stove plants, when only required in moderate numbers, do best when nice coloured tops taken off leading shoots and side-growths are made into cuttings, planted singly in small pots of sandy compost, and placed in strong, moist heat in a propagating-case or under bell-glasses.

CUCUMBER.—For winter use sow the seed in September; for spring and early summer, in January and February; those for outdoor culture, in April, to plant out at end of May or early in June. Cuttings root readily with bottom heat and a close, warm atmosphere,

and by this means not only is the true character of the parent ensured, but the plants come more quickly into bearing than seedlings.

CURRANTS.—The *White* and *Red* varieties are propagated by planting in autumn cuttings a foot long made from mature shoots of the current year's growth. These should be smoothly cut through with a very sharp knife just below a bud, all the eyes except about three at the top being removed to form clean stems and to ensure freedom from suckers. With the spade take out a vertical trench, place the cuttings therein in an upright position, 6 inches deep and 6 inches apart, so that the heads stand about 6 inches above the surface soil, fill in and tread firmly, leaving a space of 1 foot between the rows.

Black Currants are propagated in exactly the same way except that none of the buds are rubbed off the cuttings, they being left to form branches from the base later on.

CYCLAMEN.—The greenhouse varieties are raised from seed sown as soon as ripe in August, and these, by present-day treatment, can be had in flower in about fifteen months and last a long time in beauty. Well-drained pots or pans should be filled to within $\frac{3}{4}$ inch of the rim with a finely-sifted compost of loam, well-decayed leaf-mould, and silver sand in equal proportions. Water and allow to drain for an hour, then place the seeds about $\frac{1}{2}$ inch apart all over the surface and cover thinly with fine compost. Put a sheet of glass over to retain moisture, and place in a cool pit or greenhouse, shading from sunshine with a sheet of thin paper. Remove the glass when germination is effected, gradually inure to sunlight, and place on a greenhouse shelf near

the glass so that they may not be drawn up weakly. When potting off, keep the corms well up to the surface and grow on in a temperature of 60 to 65 degrees. The hardy kinds can be also raised from seed sown in a cold frame in October, to transplant the following year.

CYPERUS.—Propagate by seed and division. The Umbrella Plant (*C. alternifolius*) can also be increased by shortening the leaves of the crowns and planting them with an inch or two of the stem in moist, light compost to induce growths to start from the axils of the leaves.

CYTISUS.—The greenhouse kinds, such as *C. racemosus*, now called *C. elegans*, so largely grown for market, are propagated from cuttings, about 3 inches long, of young wood with a heel in a close, warm frame in spring. The hardy kinds are reared from seed, by cuttings of half-ripened shoots in a warm case, by layering in October, and by grafting on the Common Laburnum in March and April.

DACTYLIS.—The variegated form of Cock's-foot Grass is somewhat extensively employed in bedding. It is propagated by division of the tufts in October or April, as seed cannot be relied on to come true.

DAHLIA.—The principal methods employed in propagating these popular plants are by cuttings, by division of the roots when planting, by seed, and rarely by grafting. To obtain an abundant supply of cuttings, the roots are brought from their place of storage in spring, placed on a gentle bottom heat, and thinly covered with leaf-mould or soil, the crowns being left bare. A slight moisture, with warmth and daily syringing, induces the young shoots to grow plentifully; these, taken off and inserted as cuttings, when 2 or 3 inches

long, in small pots of sandy compost, plunged in gentle bottom heat in a close, warm frame, soon strike root and are ready for gradually hardening off. In a few days after the first crop of cuttings have been taken, other shoots will spring up from the old crowns ready for similar treatment.

Division of the roots is usually done when preparing to plant out, allowing at least one young shoot to each division, as the tubers do not produce adventitious buds anywhere except at the crowns.

If seed is sown in February or early in March in gentle heat, and the plants are grown on singly in pots ready for planting out at the end of May, they will bloom the same season, but a little later than those grown from cuttings. The single-flowered varieties do very well in this way and produce good tubers for the next season.

Grafting is done by cutting a triangular notch out of the upper end of a fleshy tuber. A young growing shoot with two or three joints is selected for the scion and cut through just below a joint; then two slices are smartly cut away to shape it to fit into the incision made in the tuber as neatly as possible (see p. 60). After binding securely but not too tightly, it is potted, so as just to cover the place of union, and kept in a close case with bottom heat until united. This plan is occasionally adopted to strengthen the growth of new or weak sorts, or to reduce the height of tall, vigorous ones by uniting them to roots of dwarfer growers.

DAPHNE.—The hardy kinds of these desirable shrubs are increased by stratified seed, by cuttings of firm shoots in autumn kept in a cold frame until callused, then placed in gentle heat to assist root production, also by layers put down in autumn. The sweet-scented

greenhouse kinds are propagated by grafting on stocks of *D. Laureola* and *D. pontica* in spring when the sap is in motion.

DATURA.—The shrubby kinds, generally called Brugmansias, are raised from cuttings of young shoots in spring when they have grown 6 inches long, taken off with a heel, inserted in sandy compost, and placed in a warm house with gentle bottom heat; the annual species from seed sown in March under glass and grown on to plant outdoors in May.

DELPHINIUMS.—The named herbaceous kinds of these stately and handsome flowering plants are increased by division of the roots in autumn or spring, also by cuttings of young shoots, 3 inches long, in a cold frame in September or March. Seeds of the annual species and varieties (Larkspurs) may be sown indoors to get them forward, or outside on a warm border in April.

DEUTZIAS.—Propagate by rather firm young cuttings, 3 inches long, under handlights in June and July, or by ripened shoots, 10 to 12 inches long, firmly planted half their length in a shady border in autumn.

DIANTHUS.—The many beautiful garden flowers of this extensive genus are mostly perennials, propagated either by seeds, cuttings, or layers (see Carnations, Pinks, and Sweet Williams). *D. chinensis* is successfully grown as an annual by sowing in pots or open ground in March.

DICENTRA (*Dielytra*).—Increased mainly by dividing the roots in early spring just before growth is commencing. Short lengths of fleshy roots planted in sandy soil in March will also produce young plants.

DICTAMNUS.—These, noted for their resinous properties and odorous exhalations, are best raised from seed

sown as soon as ripe and grown on in pots until large enough to plant out. Division of the roots is a somewhat precarious method, as they transplant badly from the open ground.

DIEFFENBACHIA.—The tops of leggy plants that have lost lower leaves make excellent cuttings, which root without difficulty in strong bottom heat and moist atmosphere. The old stems, if laid on leaf-mould or moist coconut fibre in the stove, will usually throw out short sprouts suitable for cuttings. The stems may also be cut into 2 or 3 inch lengths, and after slightly drying the cuts be planted in sandy compost under bell-glass.

DIERVILLA (*Weigelia*).—Increase by suckers, by firm green cuttings in propagating-case in summer, or by cuttings of ripe shoots planted in a north border under handlights in October.

DIGITALIS (FOXGLOVE).—Sow seed in a shady position in April or May and treat as a biennial.

DIOSCOREA.—Propagate *D. batatas* (Chinese Yam) by dividing dormant tubers; the hot-house climbers by cuttings of half-ripened shoots and tubers that form in the axils of the leaves.

DIOSPYROS.—Increase stove kinds by cuttings of ripened shoots in April and May; hardy sorts by seed sown in October. In warm countries where grown for the fruit, shield-budding and whip- and cleft-grafting on stocks of *D. Lotus* and *D. virginiana* is extensively practised with the choicer varieties.

DIPLADENIA.—The young shoots that start growth in spring are taken off with a heel, then inserted in sand and peat in a brisk bottom heat under a bell-glass.

DIPSACUS.—The Teasels, both useful and ornamental, are easily raised from seed sown outdoors in April.

DORONICUM.—Popular hardy spring-flowering plants, propagated readily by division in autumn or spring.

DRACÆNA.—The majority of ornamental foliage plants grown in gardens under this name are, perhaps, more properly designated Cordylines. Cuttings of the tops of plants that have become "leggy" by losing the lower leaves, or from shoots produced by old stems that have been headed back, root freely in sandy compost or coconut fibre in a close case or under bell-glasses with a brisk bottom heat of 75 to 80 degrees and a high, moist, atmospheric temperature. The old stems may also be cut into pieces 1 inch to 2 inches long, planted in pots or pans of similar material, and treated as above. The fleshy underground stems called "toes" may likewise be cut in pieces and so increased. With "leggy" plants the stems are sometimes induced to root just below the existing bottom leaves by making a notch or an incision in the stem in a slanting, upward direction through the middle, inserting a small stone to keep the slit open. A small flower-pot cut downwards into two halves is then tied together, fixed in position, filled with leaf-mould and sand kept constantly moist, into which roots are in due course protruded. The stem is then notched and gradually cut through until finally completely severed, when sufficient roots have formed in the pot to support the top without further assistance from the old stem and roots below.

ECCREMOCARPUS.—That favourite climbing plant *E. scaber* is grown by sowing seed in gentle heat in March to plant out in May. The roots, if protected with a covering of ashes during winter, will send up shoots again the following spring.

ECHITES.—These handsome stove twiners are propa-

gated by cuttings made from the young sprouts in spring, when they have grown about 3 inches long, inserting them in pots of sand and peat under bell-glasses with a temperature of 80 degrees.

ELÆGNUS.—Cuttings of firm shoots inserted in sandy soil in a cold frame in September will in due course root. They may also be reared by stratified seed sown in March and by layering in October.

ELODEA (*Anacharis*).—This desirable plant for fish-ponds and aquaria only needs a small stone attached to the lower part of the branches and to be dropped into the water. It sometimes grows too rampant and has to be restricted.

EMBOTHRIUM.—This gorgeous flowering shrub for outdoors in the South of England and as a greenhouse plant in colder districts is usually propagated by seed imported from Chile. It can also be raised from cuttings in spring inserted in sand and peat under a bell-glass in a temperature of 55 degrees.

EMPETRUM.—These are also of Chilean origin, and may be propagated by cuttings with the lower leaves removed, inserted in sandy peat under handlights in a shady position from June to August.

ENDIVE.—The seed of this useful salad vegetable should not be sown too early, or the plants are apt to "run" prematurely except in very cold districts. July has proved to be a good time to sow the Curled-leaved variety, and early in August for the main crop of Broad-leaved.

EPACRIS.—The propagation of Epacries and Ericas, owing to the time and careful treatment needful for success, is generally left to the professional. Special care is devoted to the drainage of the pots. Sturdy

shoots from $1\frac{1}{2}$ inches to 2 inches long are selected for the cuttings in July, or according to the condition of the growths, the bottom leaves are removed with propagating scissors, and then cuttings inserted in sifted peat and sand surfaced with a thin layer of pure, clean silver sand. They are placed in a cool, shady house and covered with bell-glasses, which are wiped dry inside each morning to remove the condensed moisture. At that time a careful scrutiny is given, and any trace of mould or decay is instantly removed. Epacries are generally easier to strike and to grow than Ericas. Great care is needed when potting off not to break or damage the young and tender roots.

EPILOBIUM.—These striking flowering plants are easily increased by seed sown in spring or summer and by division in autumn or spring.

EPIMEDIUM.—Favourite rock plants, propagated by division in July and August.

EPIPHYLLUM.—See Cacti.

ERANTHIS.—The early flowering propensities of the Winter Aconite (*E. hyemalis*) render it a welcome plant for naturalising. It is increased by division of the tubers in autumn.

EREMURUS.—These stately, hardy herbaceous plants are increased by division in March. Plants raised from seed are much longer in arriving at a flowering size.

ERICA.—See Epacris.

ERIGERON.—The desirable species and varieties of these border flowers are easily raised by seed sown outdoors in spring or by division of the roots in autumn and spring.

ERIOSTEMON.—Cuttings of these handsome flowering Australian plants are inserted in spring and covered

with a bell-glass in gentle heat until rooted, then gradually hardened off and potted up. Grafting, if the necessary skill for the operation has been acquired, will give quicker results inserting scions on established stocks of *Correa alba* in March in a close case.

ERODIUM.—The garden kinds for rockery and borders are propagated by seed sown in April, also by division of the roots in early spring.

ERYNGIUM.—The Sea Hollies have become very popular as border plants and for cutting for house decoration. Seed should be sown as soon as ripe or the roots carefully divided early in April.

ERYTHRÆA.—Propagate these pretty rock plants by seed sown in early spring and by division of the roots in April.

ERYTHRINA (CORAL TREE).—*E. crista-galli* is the species usually grown. It is propagated by taking off young shoots with a heel of the old wood in spring, inserting them in sandy soil on bottom heat in a warm house until rooted, then hardening off and growing on with cool treatment.

ERYTHRONIUM (DOG'S-TOOTH VIOLET).—Increased by offsets taken off in August.

ESCALLONIA.—Propagation is effected by cuttings of half-ripened shoots in sandy soil under handlights in August, by layers put down in October, and by suckers transplanted in April.

ESCHSCHOLTZIA.—These showy plants of the Poppy family are easily raised from seed sown in spring or autumn in any dry, sunny position where they are to flower.

EUCALYPTUS.—These are mostly raised from imported seed sown in the greenhouse in spring. When seed is

unobtainable, cuttings of side-shoots are used, and are struck under bell-glasses in heat.

EUCHARIS.—Offsets are so freely produced by these handsome flowering stove bulbs that other means of increase are not often resorted to. Seed is sometimes ripened, and may be sown in heat in early spring, but plants so raised take a longer time before reaching the flowering size.

EUCOMIS.—Offsets taken in autumn are the means of increasing these somewhat curious bulbs.

EULALIA (*Miscanthus*).—These handsome ornamental grasses are readily increased by dividing the clumps in March and April.

EUONYMUS.—Propagate the hardy deciduous kinds by seed and by cuttings of ripened shoots in autumn; the evergreen sorts by cuttings of firm shoots in early autumn, either in a cold frame or in a shady border. *E. radicans variegata*, planted deep or earthed up, will root up the stems and can be divided like an herbaceous perennial.

EUPATORIUM.—Propagation of the hardy species is easily effected by division and cuttings; the stove and greenhouse kinds by cuttings of young shoots in spring.

EUPHORBIA.—*E. fulgens* (syn. *E. jacquiniflora*) and *E. pulcherrima* (better known under the name of Poinsettia) are those chiefly grown for their highly-coloured bracts. The propagation of both is very similar, except that cuttings of *E. jacquiniflora* are usually inserted three or four round the edge of a small pot and the Poinsettias singly in small pots without crocks so that the roots may not be broken when transferring them to a larger size. Old plants that have been in a dormant condition are placed in heat, and when the shoots have

grown from 3 inches to 5 inches in length, from June to August, the cuttings are taken off, the ends dipped in dry sand to check the bleeding, then inserted in sandy compost, plunged in bottom heat in a close frame with high temperature and a moist atmosphere, and shaded from sunshine until rooted. The after-treatment is to grow on without check or pinching of the points in order to ensure large bracts.

EURYA.—*E. japonica latifolia variegata*, so much appreciated for decorative purposes in conservatory, corridor, and hall, is propagated by cuttings made from young shoots in spring planted in sandy compost and placed in a temperature of 60 to 80 degrees.

EXACUM.—The beautiful blue blossoms of these plants never fail to arrest attention. The imported seed should be sown in stove heat. Efficient drainage and careful watering are necessary in the early stages, as young seedlings are very liable to damp off unless treated with care in a light position.

FATSIA.—The useful foliage plant *F. japonica* (syns. *Aralia japonica* and *A. Sieboldi*) is successfully raised from seed sown as soon as ripe after cleaning from pulpy matter. Fresh seeds are usually obtainable in April, and there should be no delay in sowing them as soon as possible before they lose vitality. In a gentle heat germination will soon take place, and the young seedlings will be ready for pricking off. Root-cuttings in gentle heat will also succeed if planted in spring with the tops just covered, keeping the ends of the root that grew nearest the stem uppermost. In order to distinguish this it is a good plan when severing them from the plant to cut the top flat across and the bottom in a slanting direction. Cuttings of side-shoots from the

base of the stem, taken off with a heel and inserted in sandy compost in a close frame, are the usual method for the variegated forms.

FENNEL.—This herb, used in fish sauces and for garnishing, is raised from seed sown outdoors in March and by dividing the roots of established plants in spring.

FERNS.—The propagation of Ferns is effected in different ways, according to the habit and mode of growth of the many kinds. The most natural method generally is that by spores, which with many species is easy enough and gives good results, while with others it is apparently impossible. In a state of nature, especially in tropical regions, some appear to spread and increase more by creeping rhizomes underground or over the bark of trees than by any other means. Among cultivated species many of the Adiantums, Aspleniums, Blechnums, Pteris, and others will vegetate and grow up in chinks of the wall under the stages and other odd moist places like weeds, while others will not respond to the most careful treatment.

Ferns forming tufts and crowns, such as Adiantums, can usually be successfully divided. In some species young plants form at the ends of the fronds. Tiny plantlets are borne on the fronds of Aspleniums, and if the fronds be pegged down to the surface of a pan filled with suitable compost these plantlets will in due course root and form individual plants. The rooted rhizomes of Davallias can be cut off and potted to form separate plants.

The raising of Ferns from spores is of all these different methods the most interesting and fascinating in the propagation of these favourite plants. Spores of

Ferns differ from the seeds of flowering plants, inasmuch as the latter have already been fertilised, and each perfect seed contains an embryo bud or plant in miniature. Spores, on the other hand, are simple cells of protoplasm endowed with life, fertilisation being effected when the growth therefrom reaches the prothallium stage. Any time during February or March is a good time to sow the spores of Ferns. By doing so at such an early season the young plants are enabled to attain sufficient size and strength to pass through the following winter with safety. It often happens that when the sowing is delayed until late in the season the young plants lack the strength to withstand the foggy and prolonged dull weather to which they are subjected. Pots 5 inches in diameter are a suitable size to use, and they should contain drainage material (broken potsherds) to two-thirds of their depth. The soil when pressed down should reach to within $\frac{1}{2}$ inch of the rim, and may consist of a mixture of peat and loam that has been passed through a sieve of $\frac{1}{4}$ -inch mesh. Before use it should be either scalded or baked sufficiently to destroy all weed seeds and germs it may contain. A thorough soaking of water should then be given, and a short time allowed for it to drain. The spores, which are extremely minute, should then be thinly scattered all over the surface as evenly as possible; they do not need any covering with soil. A sheet of glass should be placed on the top of each pot for protection, and also to retain moisture. The soil must be kept continually and uniformly moist; but on no account must any attempt be made to water over the surface, or the spores will inevitably be washed away. The pots should be stood in saucers of water in a shady but light part of a frame

or greenhouse. If, however, a temperature of 75 degrees is available the process will be much hastened.

In due course a green growth will appear on the surface of the soil resembling that of the Common Liverwort (*Marchantia polymorpha*). This is the prothallium stage, during which time fertilisation takes place, and the motile zoospores are facilitated in their movements by the moisture condensed on the prothallus to fulfil the function of fecundation. At this period it is very important that there be no lack of moisture. Should the soil show any tendency to dryness, this may be corrected by standing the pot for a few minutes in a vessel of water nearly to the level of the soil inside.

Before the green growth gets too crowded, pots of compost should be prepared as described for sowing, the soil being pressed lightly and level with the base of another flower-pot, but not watered. With a small pointed stick lift the tiny tufts of green growths and prick them in $\frac{1}{2}$ inch apart. Give a good watering through a fine rose to settle the soil, and return them to their former quarters, covering each pot with a pane of glass as before. From these the young ferns will gradually develop. The glass may be first tilted to admit air, and after a few days be removed altogether. In due course the young plants will need transferring singly into small pots.

A rough and ready way sometimes practised in raising free-growing species is by scattering the spores on the surface of pots in which other plants are growing or under the staging where the soil is kept moist and not likely to be soon disturbed.

FICUS.—The species most extensively cultivated for ornamental purposes are *F. elastica* and *F. stipulata*

(syn. *F. repens*). Both propagate readily by cuttings inserted in sandy compost placed in bottom heat in a close case until rooted. Some large growers of *F. elastica* insert the cuttings in sawdust until rooted. When large numbers are required, cuttings of single eyes may be used with a leaf attached and supported by a small stake and tie.

Ficus carica, in its numerous varieties as a fruit-producing tree (the Fig), may be propagated by seed, cuttings, layers, suckers, grafting, and budding. In practice the method adopted is almost entirely that of cuttings of the previous season's growth taken off in spring just before growth commences, selecting short-jointed shoots 6 inches to 9 inches long, preferably with a heel of the old wood, inserting them in pots of sandy soil and plunging in bottom heat in a warm house.

FITTONIA.—These stove plants with beautiful veined leaves are readily propagated in spring and summer by cuttings or division, placed in bottom heat under a bell-glass.

FORSYTHIA.—The early flowering shrubs of this genus are increased by cuttings of young shoots in July and August in a close propagating-frame, with or without heat. The branches that droop to the ground often root at the tips and may thus be utilised.

FRANCOA.—These useful plants for both indoors and outside in sunny, sheltered positions, are raised from seed sown on the surface of pans of peaty compost covered with a pane of glass in gentle heat in early spring, also by division in March.

FREESIAS.—The great popularity of these fragrant flowers needs no stressing. They are among the quickest Cape bulbs to attain to flowering size when raised from seed, which should be sown so soon as ripe

in pots of light sandy soil placed in a cold, sunny frame. Some of the strongest may blossom the following year, others will make good flowering bulbs for the next season. Offsets may also be taken when repotting and grown on for a future display.

FRITILLARIA.—The well-known Crown Imperial and others of this family are mostly propagated by offsets. Seedlings require from four to six years to grow to flowering size.

FUCHSIAS.—These deservedly popular plants continue to claim a large number of ardent admirers. They are easily increased to almost any extent by cuttings. The best way to obtain an abundant supply is to bring old plants that have been kept in a dormant condition during the winter into a little warmth and moisture, which will cause them to sprout; and these growths, cut off, will readily root and thrive if inserted in pots or boxes of sandy soil placed in bottom heat in a close propagating-frame. In preparing the cuttings it is not necessary to cut to a joint; they may be cut anywhere. Internodal cuttings of Fuchsias root freely if inserted firmly up to the lower leaves. A batch of autumn cuttings from non-flowering shoots put in about October, and grown on steadily through the winter near the glass roof to ensure sturdy growth, will supply useful-sized plants for flowering in May and June. All the flower-buds should be kept pinched until a few days before they are wanted to blossom. The hardy kinds are also readily struck from cuttings in spring.

FUNKIA.—These have not only ornamental foliage, but some at least have handsome and fragrant flowers, useful for both indoor and border decoration. They are easily propagated by division in March and April.

GAILLARDIA.—The annual and perennial kinds of these

free-flowering border flowers are easily raised from seed sown indoors in April to provide plants for putting out in June. They may also be propagated by cuttings of young shoots inserted under handlights or in a cold frame in August. The best time for dividing the roots of the perennial kinds is in March.

GALANTHUS (SNOWDROP).—Seeds are rarely used, although they grow very well, as the seedlings take three years to reach flowering size, while offsets naturally produced in tolerable abundance will often blossom in a year.

GALAX.—This neat little rock or border plant is propagated by dividing the clumps in autumn.

GALEGA (GOAT'S RUE).—There is no difficulty in propagating these useful border flowers by division in autumn or spring. Seeds may also be sown in a cold frame in October, or outdoors in sunny positions in April.

GALTONIA.—The best species to grow is *G. candicans* (syn. *Hyacinthus candicans*), which is propagated by offsets from the old bulbs. Seedlings take from four to five years before arriving at a flowering stage.

GARDENIA.—These favourite stove flowering shrubs are propagated without much difficulty if half-ripened, healthy shoots are selected for cuttings in January, especially if they can be taken off with a heel of the old wood attached. Insert them singly in small pots filled with a mixture of sand and peat, and plunge the pots in a bottom heat of 75 degrees in a close case or cover with bell-glasses.

GARLIC.—This plant of the Onion family is increased by dividing the cloves of the bulbs and planting them with a shallow covering of about an inch of soil in the

open ground in March, or by seed sown outside about the same time.

GARRYA.—Grown against a wall for shelter, the pendulous catkins of the male plants of *G. elliptica* make an effective display. The plants are raised by inserting cuttings of half-ripened shoots, 3 inches or 4 inches long, in sandy soil under handlights or cloches in August, and by seed sown in pots in a cold frame in September or October.

GAULTHERIA.—The hardy kinds for peaty borders and rockeries are propagated by division, by layering, and by seed sown outdoors in April.

GAZANIA.—These showy and brilliant flowers for sunny borders in summer can be readily increased by cuttings made from side-shoots obtainable from the bases of the plants and inserted in sandy soil in a close frame in July and August.

GENISTA.—The principal methods of propagation are by seeds sown outdoors in spring and by layering in October.

GENTIANA.—This large genus contains some beautiful flowering plants, some of which are not easily increased and established. Seeds are slow to vegetate, while division, which answers very well with some, is impracticable with others. The well-known *G. acaulis* submits to division fairly well if carried out in March, but most of the family are extremely sensitive of disturbance at the roots. Plants that ultimately result from seed sown in well-drained pots as soon after maturity as possible need careful handling when pricking off and potting up, so as not to injure their tender roots.

GERANIUM.—There are some very desirable subjects among the numerous representatives of this large genus

of hardy herbaceous plants. They are propagated by seed sown either in a frame or outdoors in April, and by division of the roots in autumn or spring. For greenhouse and bedding Geraniums, see Pelargoniums.

GESNERA.—With these plants propagation is effected by planting offsets of the scaly tubers that have increased at the roots, also by stem-cuttings inserted in pots of sandy peat in a close propagating-case, or by detached mature leaves with the petiole inserted and the blade incised through the veins and pegged down flat on the compost.

GEUM.—These pretty border flowers are increased by seed sown in spring and by division of the roots in autumn.

GILIA.—Sow seed in April on a sunny border where the plants are intended to flower, and thin out in May to 2 inches or 3 inches apart.

GLADIOLUS.—The large and small bulbils, called "spawn," produced at the base of the old corms are mostly relied on for reproduction, as if planted and grown on they flower in one or two years. Seedlings raised from seed sown in March generally require to be grown on for at least three or four years before reaching flowering size.

GLORIOSA.—Offsets produced at the roots, if removed carefully when repotting in spring just before growth commences, are mostly to be relied on. When seeds are used they should be sown singly in small pots of sandy compost in January and plunged in bottom heat to start them into growth.

GLOXINIA.—Excellent results are obtained by sowing a good strain of seed at the end of January or early in February. Provide efficient drainage in clean pots,

which fill to within $\frac{3}{4}$ inch of the rim with a compost of loam, leaf-mould, and sand in about equal proportions that has been passed through a $\frac{1}{4}$ -inch sieve. Dip the pot into a vessel of water nearly to the level of the soil inside to moisten it thoroughly, and stand on a level surface to drain for an hour. The seed being extremely minute, it is a very good plan to mix it with a little fine, dry silver sand in order to distribute it evenly. Scatter it thinly over the surface of the pots of compost, and sprinkle a very small quantity of silver sand over, but barely enough to cover the seed. Plunge the pots in a bottom heat of 75 degrees, cover each pot with a sheet of glass, and this with a sheet of brown paper. If condensed moisture appears too abundant on the underside of the glass, take this off and wipe it dry each morning.

In nine or ten days the young seedlings may be expected to appear, and the brown paper covering may then be removed. The glass may now be tilted to admit air, and finally removed altogether, to prevent damping-off by an excess of confined moisture. When the first two rough leaves appear, lift the seedlings with the point of a label and prick them out an inch apart in pots of similar compost to that used for sowing the seed. Immerse the pots in warm water, to moisten the compost, and keep the tiny plants close and shaded from sun until re-established. When large enough, transfer them singly to small pots, continue to shade from bright sunshine, and grow on briskly without check for flowering from July to October.

Young shoots from tubers just started into growth make good cuttings, which root readily in a warm, close propagating-frame. Mature leaves with a short

piece of the stalk attached, inserted as cuttings and similarly treated, will result in a tuber forming at the base of each for flowering next year. If a greater number of smaller bulbils are desired, the blade of the leaf may be laid flat on the surface of the compost and weighted or pegged down, with incisions cut through the mid-rib 1 inch apart, at which places small growths will result.

GOMPHRENA (GLOBE AMARANTH).—Seed of these so-called everlasting greenhouse flowers should be sown in pots of light sandy soil in gentle heat in March. The flowers required for drying and for use in winter decoration should be cut just before they have attained to full maturity.

GOOSEBERRY.—The propagation of bushes of these useful fruits may be carried out by seed, cuttings, layers, or suckers, but except in special cases increase by cuttings is solely practised. Strong, well-ripened shoots of the current year's growth should be selected and taken off as near down to the old wood as possible in October. Shorten the tops back to about a foot in length, carefully remove all eyes from the lower half to ensure a clean stem and freedom from suckers, and insert as recommended for Currants.

GORARDS.—Seeds of those Gourds grown for ornamental purposes should be sown in gentle heat in April, the young plants resulting grown on without check and hardened off ready for planting out in sunny, sheltered situations at the end of May or early in June. If at that time cold nights prevail, a little shelter or covering should be afforded to protect them from injury.

GREVILLEA.—*G. robusta*, the graceful foliage subject now so popular as a room-plant and for decorative

purposes, and extensively produced by market growers, is raised from fresh imported seed sown in gentle heat in March. If the seeds are inserted edgewise, point downward in the soil, and just covered, germination is apparently quicker and better. The plants should be grown entire, not pinched.

GUNNERA.—These remarkably large-leaved foliage plants, so effective for the margins of lakes and water-courses, are reproduced from seed and by the division of established plants.

GYNERIUM (PAMPAS GRASS).—Sow seed in March under glass in a temperature of 55 to 65 degrees, and grow on in pots until large enough to plant in permanent positions outside in April of the following year.

GYPSOPHILA.—Both the annual and the perennial kinds of these useful plants for cut flowers grow readily from seed sown in April. The perennials may also be increased by division just before growth commences in spring.

HÆMANTHUS (BLOOD FLOWER).—These remarkable bulbous plants are propagated by offsets taken when new growth is commencing and grown on in the temperature of an intermediate house.

HAMAMELIS (WITCH HAZEL).—Propagate by layers put down in autumn. The Japanese species may be grafted on stocks of *H. virginica* in March.

HEDYCHIUM.—These desirable, fragrant, stove herbaceous plants, of which *H. coronarium* (Indian Garland Flower) is a good example, are easily increased by dividing the creeping rhizomes when repotting old plants in March or April.

HEDYSARUM CORONARIUM (FRENCH HONEYSUCKLE).—This old-fashioned border flower, so highly esteemed by

our ancestors, is easily raised by sowing seed in a sunny position outdoors in April.

HELENIUM.—Increase these herbaceous perennial and annual border plants by seed sown in April and by division of the roots in autumn or spring.

HELIANTHEMUM (SUN ROSE).—Propagate these sun-loving plants by seed sown outdoors in April and by cuttings of young shoots inserted in pots of sandy soil placed in a cold frame with shade from sun in August.

HELIANTHUS (SUNFLOWER).—Increase the annual sorts by seed sown outdoors in March or April, and the perennial kinds by division of roots in October or March.

HELICHRYSUM.—The half-hardy annual varieties grown for border display and for cut everlasting flowers are raised from seed sown indoors in gentle heat in March for transplanting outside in warm weather in April or May.

HELICONIA.—These fine foliage plants are increased by division and by cutting off pieces of the rhizomes at the time of repotting when growth is just about to start in spring.

HELIOTROPIUM (CHERRY PIE).—The named varieties usually cultivated are propagated from cuttings 2 inches or 3 inches long, which are obtainable in tolerable abundance from old plants placed in heat in early spring. These root readily in a close frame with gentle bottom heat. Young flowerless shoots from border plants may be struck in the same way in August to grow on through the winter with single stems, pinching out any side-growths to form standards for the following season. Seed sown in warmth early will supply plants that with liberal treatment will flower the same season.

HELLEBORUS (CHRISTMAS ROSE AND LENTEN ROSE).—Increase by carefully dividing the roots in July. Seed sown as soon as ripe will grow, but this is a slow method of propagation not often resorted to.

HEMEROCALLIS (DAY LILY).—Although the individual blossoms are of short duration, they are freely and successively produced. Propagation is effected by division of the roots in March.

HERACLEUM.—These giant and somewhat coarse-growing plants are useful and effective in suitable positions in the wild garden and at the waterside. They are easily raised from seed sown in March or by division in October or March.

HESPERIS (ROCKET). — *H. tristis* (Night-scented Rocket) and the single Rockets can be easily raised by sowing seed in sunny positions outdoors in April; the double varieties of *H. matronalis* by cuttings put under handlights in shady border in September or October.

HEUCHERA (ALUM ROOT).—The desirable species, *H. sanguinea* and its varieties, are propagated by dividing the crowns in spring.

HIBBERTIA.—The most useful species, *H. dentata*, may be increased by cuttings of moderately firm shoots under a bell-glass in heat in spring and summer.

HIBISCUS.—The gorgeous and well-known *H. rosa-sinensis* and its varieties are propagated by inserting rather firm cuttings in a warm house and covering them with bell-glasses until rooted.

HIPPEASTRUM.—The named sorts are raised from offsets carefully removed from old bulbs. Excellent results are also obtained by raising plants from seed of a good strain. It should be sown as soon as ripe in pots or shallow pans filled with a mixture of equal parts of loam

and leaf-mould, with a liberal admixture of silver sand. Sow about $\frac{1}{2}$ inch apart, cover with a thin layer of the fine compost, and place in a temperature of 65 to 70 degrees. When the third leaf appears, transfer the seedlings to 2-inch pots, keeping them well up to the surface. Then grow on continuously in a moist atmosphere of 60 to 70 degrees without drying off or resting. They may be expected to blossom the second season.

HIPPOPHAË (SEA BUCKTHORN).—Seed may be sown out of doors after cleaning. Increase is also effected by layers put down in autumn, by suckers, and by cuttings of the roots outdoors in February and March.

HOLLY.—The common green Holly is raised from seed that has been stratified in a rot-heap for a year and then sown outdoors in October. Some of the seedlings will grow the following spring, while others will remain dormant and not show signs of germination for another twelve months or even for two years. They are ready for transplanting when two years old. Variegated sorts are often veneer-grafted on seedling stocks of the green Holly in March, budded in May with a pushing bud, or in August with a dormant one.

HOLLYHOCKS.—Seed should be sown as soon as ripe, and the resulting young plants, if of choice varieties, potted up and wintered in cold frames. Seed sown in gentle heat in February and the seedlings grown on and planted out in May will produce flowering plants the same season. Single-flowered sorts, which are now very popular, will spring up self-sown on some of our railway banks and grow into good flowering plants without much trouble, making a good display of many charming colours when in blossom where they have space for development.

Cuttings of young shoots 3 inches long, taken off close to the old roots, will strike if placed in small pots of light sandy soil, stood in a close frame, and shaded until roots are emitted. Special varieties can thus be perpetuated. Division after flowering can be effected with strong plants having numerous shoots if care be taken to cut them through so that a shoot and some roots are attached to each piece. Shoots that have attained to some degree of firmness can be cut into single eyes, like vine eyes, removing the blade of the leaf, but retaining a few inches of the petiole. These, planted in pots of sandy compost surfaced with a thin layer of silver sand and placed in a close, warm frame, will grow and form nice plants for the following season.

HORSERADISH.—This is grown from root-cuttings, called "sets," about 3 inches long. When making them, cut the bottom part slanting and the top flat across, to indicate the end to be placed downwards. Plant in January or February, 8 inches deep, 1 foot apart, in rows 2 feet asunder, in deep, rich soil.

HOYA (HONEY PLANT OR WAX FLOWER).—Propagate these by cuttings, preferably in spring, made from shoots of the previous year's growth; insert in sand and peat, plunge in bottom heat in a close, warm case or under a bell-glass, and water sparingly. Some growers prefer to leave the cuttings exposed for a day to dry before inserting them. If layering is preferred, it is only necessary to lower the branches, remove some of the leaves, and cover with compost, which should be kept moist until the young plants are sufficiently rooted to be severed from the parent. The pretty *H. bella* is sometimes grafted, using for stocks the stronger and more free-growing *H. carnosa*.

HUMEA.—Some are very partial to the fragrance of the leaves of *H. elegans*, a biennial plant of graceful appearance when in flower. The seed should be sown in July in pots of finely-sifted soil, covered thinly with a sprinkling of silver sand, and placed in a cool, shady frame. When the seedlings are large enough, transfer to small pots, grow through the winter in a cool house where frost is just excluded, and plant out in June.

HUMULUS (HOP).—The common Hop is increased by seed or by division in spring. The Japanese, both the green and variegated-leaved, are treated as annuals, being raised from seed sown indoors in April, or, where the plants are to grow outside, early in May.

HYACINTHUS.—For propagation of the Hyacinth, see **BULBS**, p. 19.

HYDRANGEA.—These popular plants propagate readily by young or partially ripened shoots of about four joints inserted singly in small pots of sandy soil plunged in bottom heat in a close, moist frame. If desired, old plants that have several stems from the base may be divided in March.

HYPERICUM.—Propagation is readily effected by seed sown in the greenhouse or outdoors in March. The shrubby species grow very well from cuttings of firm shoots 3 inches long under handlights in August or September. The tufted and creeping kinds are increased by division in autumn or spring.

HYSSOP.—This aromatic herb, used in seasoning, may be raised from seed sown outdoors in April, by cuttings inserted in shady border in June, and generally by dividing old plants in spring or autumn.

IMPATIENS (BALSAM).—A good time to sow Balsam seed is towards the end of April, in a temperature of

about 65 degrees. The hardy annual kinds of *Impatiens* may be sown outdoors in April. Stove and greenhouse species, such as *I. Sultani*, sown in March and grown on without check, will make good flowering plants the same season. These also propagate very readily from cuttings of strong, healthy shoots inserted singly in small pots in a propagating-frame at almost any season.

INCARVILLEA.—The hardy kinds, such as the beautiful *I. Delavayi*, are readily increased by sowing seed in gentle heat in March. The crowns of strong plants may also be divided in early spring.

INDIGOFERA.—These include hardy, greenhouse, and stove plants. They are propagated by seed sown in March and by cuttings of firm young shoots under bell-glasses in summer.

INULA.—The vigorous, hardy, cultivated species of this genus are easily raised from seed sown outdoors in March or April, and by division of the roots in October or March.

IPOMÆA.—The pretty, half-hardy, climbing sorts grow readily from seed sown either indoors or outside, according to their hardiness. The above species, of perennial duration, are propagated by cuttings of side-shoots taken off with a heel and placed in bottom heat in a close case, also by layers. These last are a good means of increasing the beautiful *I. Horsfalliae*, which does not conform to the cuttings system; it, however, succeeds and grows well when whip-grafted on a free-rooting sort such as *I. insignis*, also by root-grafting.

IRESINE.—Cuttings of these coloured foliage plants will root in a close, warm frame at almost any season. Old plants or autumn-struck cuttings, kept moderately dry in an ordinary greenhouse through the winter, will

produce abundant growths suitable for the purpose if given a little more heat and moisture in early spring.

IRIS.—This is an exceedingly large genus containing many very beautiful species. We may divide them broadly into two groups : those with bulbous and those with rhizomatous roots. The first are increased by offsets from the old bulbs taken off and planted just before growth commences, also by seed sown, when ripe, in pans or boxes of sandy soil placed in a cold frame. The latter germinate the following spring, but three years must elapse before flowers can be expected. The rhizomatous section are increased by division and by cutting up the creeping stems. (See illustration, p. 17.)

IXIAS.—Propagation by offsets taken from the old bulbs is the quickest means, as the plants then generally flower the second year, whereas seedlings, although easy enough to raise, take three or four years to develop into flowering bulbs.

IXORA.—Short-jointed and moderately firm young shoots make suitable cuttings, which, if planted singly in small pots of peat, leaf-mould, and sand, and plunged in a bottom heat of 80 degrees in a close case and shaded, soon root.

JACARANDA.—The Mimosa-leaved species make very pretty plants when grown on a single stem. Propagate by cuttings taken from about half-ripened shoots, inserted in a layer of sand over sandy peat in a close, moist heat during summer, with shade from sun.

JACOBINIA.—All these pretty stove flowering plants strike freely from cuttings of young shoots, which are usually obtained from old cut-back plants in early spring and inserted in a compost of leaf-mould, peat, and sand in brisk heat under bell-glasses.

JASMINUM.—The stove and greenhouse kinds are in-

variably increased by cuttings of firm shoots inserted in loam, peat, and sand placed in a close case in spring and summer; the hardy sorts by suckers and cuttings of ripened shoots, 3 inches to 6 inches long, in a cold frame in September and by layers put down in summer.

KALANCHOE.—Increase these succulents by seeds sown in pans of sandy mould in March, the young seedlings being grown on near the glass; also by cuttings, which should be exposed to sun and atmosphere for a few days before inserting them in small pots on the greenhouse shelf with just enough water to keep the soil from becoming quite dry.

KALMIA.—Propagate during the summer by young shoots inserted in sandy peat in a shady border under handlights and by seed sown in a cold frame in April, the seedlings to be hardened off and planted outside when large enough.

KENNEDYA.—Insert firm side-shoot cuttings in sand and peat in spring, and place in a close, warm frame until rooted. Seeds germinate readily, and should be sown in April.

KERRIA (JEW'S MALLOW).—Pretty, hardy, Japanese flowering shrubs (there are both single and double forms), which may be increased by cuttings of young shoots with a bell-glass in summer, by layering in autumn, or by division of the roots in spring.

KNIPHOFIA (RED-HOT POKER).—Mostly increased by dividing the crowns in March. Seed may be sown in spring in gentle heat.

KOCHIA (MOCK CYPRESS).—Propagate from seed sown indoors in March, the seedlings being given similar treatment to other half-hardy annuals grown in pots.

KOHL RABI (TURNIP-ROOTED CABBAGE).—Seeds should

be sown in April and plants put out 1 foot apart in rows 2 feet asunder. During growth the stems should be left uncovered, not earthed up.

LABURNUM.—The species of these well-known flowering trees are raised from seed sown outdoors in March. The varietal forms are perpetuated by budding on stocks of the common Laburnum in July or by grafting in March.

LACHENALIA.—Offsets of these desirable greenhouse bulbous plants are produced pretty freely by old bulbs and—except the very smallest—flower the following season. Seedlings blossom about the second year from the time of sowing the seed.

LAGERSTRÖMIA (CRAPE MYRTLE).—Rather firm side-shoots should be taken off with a heel in spring and inserted in sandy peat, covered with pure sand, plunged in bottom heat with a bell-glass over them.

LANTANA.—Cuttings of non-flowering shoots from cut-back plants root readily in spring or autumn in a close frame with bottom heat. Seed may be sown in gentle heat in March.

LAPAGERIA.—Seed sown in gentle heat soon after ripening may be employed, but the usual nursery method of increasing the white-flowered form *L. alba* and choice varieties of *L. rosea* is to form a raised bed about 5 feet from the glass roof composed of 3 parts peat, 1 part loam, and a liberal admixture of silver sand. In this the parent plant is placed, and strong, long, healthy shoots are laid down, tongued on the underside at intervals in the same way as Carnations, fixed in position with pegs, and just covered with the compost. The leaves are not removed, but left protruding, sustaining no injury. Thus growths are induced to break

from the dormant buds of the layered stems. As soon as these appear, a stick or a piece of laid cord is fixed to enable them to twine up to the roof. It takes one or two years for the plantlets to become sufficiently well rooted to be cut from the parent for potting off singly. It will be seen that this system differs from the ordinary process of layering, the object in view not being to root the branch laid down to form the future plant, but to cause growths to spring from dormant buds and to root and form young plants. A house with a north aspect is usually selected for the purpose.

LATHYRUS (EVERLASTING PEA AND SWEET PEA).—The perennial kinds may be raised from seed sown outdoors in April, by cuttings of young shoots, and by dividing old rootstocks early in March. The popular annual Sweet Peas may be sown indoors in March for planting out in May, or outdoors, where intended to flower, in April.

LAUREL.—The common evergreen Laurels (*Cerasus lauro-cerasus*) are propagated by cuttings of the current year's growth about a foot long with lower leaves removed and smoothly cut just below a joint, then firmly inserted 6 inches deep in a shady border in September and October.

LAURUS.—The aromatic Sweet Bay can be propagated by firm cuttings inserted in sandy soil under handlights in August with shade from sunshine, also by seed and by layers put down in autumn.

LAVANDULA.—The Lavender may be increased by cuttings under handlights in August and September, and more easily by pulling old plants to pieces and planting rooted portions in October or March.

LAVATERA.—Both annual and perennial sorts are easily

raised from seed sown out of doors in autumn or spring; the perennials also by cuttings for retaining the characters of special varieties.

LEEK.—For an early crop sow seed in a frame in February. The main crop for general use should be sown out of doors about the middle of March.

LEONOTIS " (LION'S TAIL).—The pretty *L. leonurus* should be raised from cuttings in gentle bottom heat in a close frame early in spring.

LEONTOPODIUM (*Edelweiss*).—Propagate by division in April or May or by seed sown in fine loam mixed with small granite chips in a dry, sheltered place in autumn.

LESCHENAUTIA.—*L. biloba major* is one of the finest of blue-flowered greenhouse shrubs in cultivation when treated with special care not to injure roots in repotting and to water with caution, using rain water only. Points of young shoots moderately firm should be inserted in pots of sand in early spring and covered with a bell-glass in the gentle heat of an intermediate house.

LETTUCE.—Without doubt this is the most popular and extensively used of salad vegetables. For summer crops the seed is sown under glass in January and February. In March and onwards at intervals of two or three weeks until August, outdoor sowings are made for successions. For winter Lettuce only hardy varieties for growing in frames and sheltered positions are selected, these being sown in August.

LEUCADENDRON (SILVER TREE).—The dried, silvery leaves of *L. argenteum* are imported from the Cape of Good Hope in considerable quantities for ornamental purposes and for wreath-making. Small specimens will grow in an ordinary greenhouse and may be propagated by cuttings under bell-glass in spring.

LEUCOIUM (SNOWFLAKE).—Increase by offsets taken off and replanted as soon as the old bulbs ripen.

LEYCESTERIA.—This distinct hardy shrub can be increased by cuttings of young side-shoots, with a heel of the old wood attached, in spring under bell-glass in mild heat, by ripened shoots in September under handlight, and by seed sown in cold frame in spring.

LIBONIA.—Young shoots from old plants that have been placed in heat in spring supply cuttings that root readily when inserted in pots of sandy compost in a close frame. For growth the temperature of an intermediate house is suitable.

LIGUSTRUM.—The different kinds of Privet are mostly propagated by cuttings, 6 inches to 12 inches in length, inserted in a shady border or in a cold frame in September and October; the common kind by stratified seed sown in March.

LILAC.—These are propagated by rooted suckers, cuttings, layering, and grafting on stocks of the common Privet. The last method cannot be recommended owing to the nuisance caused by suckers. Cuttings of short-jointed, not too stout, half-ripened shoots put in an ordinary frame about midsummer and shaded make good specimens. Small cuttings from plants that have been forced strike even more readily. Layers put down in September also make good plants not liable to throw up suckers.

LILIUM.—The most general method of increase is by offsets planted and grown on to a flowering size. The bulbils produced in the axils of the leaves of such as *L. bulbiferum* and *L. tigrinum* may be similarly treated. Seed and scales, except for the raising of new varieties and increasing scarce kinds, are not generally adopted,

as seedlings, bulblets, and scales take from three to six years to flower. The seeds of different species vary considerably in the length of time needed for germination, some sprouting in a few days, while others require several months.

LILY OF THE VALLEY (*Convallaria majalis*).—When the crowns of these become overcrowded they should be divided singly in September or October, retaining some roots with each as illustrated (p. 15), and be planted in a partially shaded position in rich, moist soil, 2 inches to 3 inches apart, only slightly covering the tops with the soil. A good time for sowing seed outdoors is in March, but as the crowns are generally so freely produced, this mode of increase is seldom necessary.

LINARIA (TOADFLAX).—The pretty annual kinds and the perennial species can be very well raised from seed sown in April where the resulting plants are intended to flower. A sunny position should be chosen. The perennials of tufted habit may also be increased by division in autumn or spring.

LINUM.—Most of the pretty annual and perennial kinds of this interesting genus can be raised from seed sown in March or April out of doors in their permanent positions to avoid transplanting. Division of the roots of perennials is best effected in early spring.

LIPPIA (SWEET-SCENTED VERBENA).—This delightfully fragrant plant, so well known to many under the old name of *Aloysia citriodora*, can be easily propagated by cuttings. Young shoots that grow from the old branches in spring, if slipped off when 3 inches or 4 inches in length, strike readily if quickly inserted in pots of sandy soil surfaced with a thin layer of pure sand and placed in a close, warm frame.

LIQUIDAMBAR.—The species mostly grown in this country, *L. styraciflora*, is often propagated by imported seed kept in the catkins until required for sowing, being difficult to extract. The catkins are first exposed to sun or fire heat, causing them to crack and open, and the seeds can then be taken out. The latter are often slow to germinate. Layers put down in autumn also prove successful, and are ready for taking off and replanting in the following autumn.

LITHOSPERMUM.—*L. prostratum*, a beautiful blue-flowered rock plant, is not always easy to propagate. The most promising cuttings are those taken off in summer from the previous year's growth, inserted in sand and peat, and placed in a cold frame.

LOBELIA.—The hardy and half-hardy herbaceous perennials are propagated by seed sown in gentle heat in February, and with good treatment will flower the same season. Cuttings and division of the roots in spring are other means. The selected bedding varieties of *L. erinus* are increased by cuttings obtained from old plants that have been wintered in a greenhouse and brought into heat in early spring to excite growth. It is not necessary to cut to a joint, but they should be inserted in sandy soil and placed in a warm frame. When uniformity of habit is not of material importance a stock can soon be raised from seed of which carefully saved strains are obtainable. They should be sown in a warm house in March.

LOGANBERRY.—Lowberry and other varieties of this family can be readily propagated by pegging down the ends of shoots in July and covering them with about 6 inches of soil, made firm and kept moist, leaving a few inches of the growing tip free from growth. By planting

time they will be sufficiently well rooted for cutting free and for removal to permanent quarters or nursery beds. Well-established plants develop growths 12 feet to 18 feet long.

LONICERA (HONEYSUCKLE).—These favourite and fragrant-flowered climbers are easily increased, either by cuttings of firm shoots, 6 inches to 9 inches long, firmly planted in a cold frame or sheltered border in October, or by layers put down in late summer and autumn.

LUCULIA.—*L. gratissima*, the species generally grown, is a handsome, sweet-scented, stove flowering shrub. It is best raised from imported seed sown on arrival. Cuttings are generally very unreliable. Young shoots inserted in spring or early summer in sandy compost under a bell-glass with bottom heat sometimes succeed.

LUNARIA (HONESTY).—Valued for winter decoration in combination with dried ornamental grasses and everlasting flowers, on account of the satiny partitions of the seed-vessels, it is raised from seed sown in April where intended to be grown.

LUPINUS.—Seeds of these handsome annual and perennial border flowers may be sown outdoors in April. The perennials may also be increased by division in March and April.

LYCHNIS (*Campion*).—Propagation of these well-known plants is effected by seed sown in a sunny position outdoors in March and April, and by division of the roots in spring and autumn.

LYCIUM (BOX THORN).—Trailing plants suitable for training over porches and arbours. They are easily increased by taking off rooted suckers and by cuttings of partly-ripened shoots, 6 inches long, planted out of

doors in a shady border in September, also by layering about the same time.

LYSMACHIA.—Most of the cultivated species are easily propagated by division in March or April and by cuttings of young shoots in spring.

LYTHRUM.—Like the preceding, these are generally easily increased by division. *L. roseum superbum*, a selected form of an indigenous species, is a capital plant for moist situations and by the waterside; can be raised from seed sown in April.

MACKAYA (*Asystasia*).—The beautiful greenhouse flowering plant *M. bella* is always much admired when in blossom. Young shoots taken in spring from plants that have been kept dormant during winter form excellent material for cuttings, which root readily in a close, warm frame shaded from sunshine.

MAGNOLIA.—These handsome flowering subjects can be raised from seed, which should be sown as soon as ripe, after cleaning, in pots of sandy soil placed in a frame or greenhouse and kept moist until growing. Tongueing and layering the branches succeeds if they are put down in late summer and autumn. Scarce and rare kinds may be veneer or side-grafted on stocks of *M. acuminata* or *M. tripetala* in a warm, close case about July or August.

MALOPE.—Seeds of the popular free-flowering *M. grandiflora* should be sown on a warm, sunny border in April or May.

MARANTA AND CALATHEA.—These closely allied plants are increased by division and by cutting the rhizomes with eyes and roots attached into pieces in spring, placing them in a close and warm atmosphere with shade until re-established.

MARIGOLD.—There are now some good named varie-

ties of *Calendula*, which should be sown outdoors in a sunny position in March where they are to flower. The French and African sorts (*Tagetes*) may be sown in a greenhouse or frame about the middle of April for planting out in May. A sowing may also be made on a warm border outside in May.

MARJORAM.—*Origanum Majorana* (Sweet Marjoram) and *O. Onites* (Pot Marjoram) are cultivated for their aromatic leaves and tender shoots for use in seasoning. The former is treated as an annual, being raised from seed sown in gentle heat in March for planting out at end of April. It also succeeds if sown on a sheltered, warm, sunny border outside about the middle of April. The Pot Marjoram can be raised from imported seed sown in April, but is more generally propagated in March or April by dividing old plants with roots attached, and putting them in rows 9 inches apart, allowing 1 foot between the rows.

MAURANDYA.—These trailing plants with Gloxinia-like flowers are raised from seed sown in heat in early spring and the plants grown on in pots for hardening off, planting out in May or June in a warm, sheltered position outside when danger from frost is past.

MECONOPSIS.—Handsome flowering annual plants of the Poppy family with blossoms of various choice colours. The Eastern species are raised from seed sown in a greenhouse in March or planting out in June. *M. cambrica* and its varieties may be sown outdoors in April.

MEDINILLA.—Propagate in spring by cuttings of rather firm side-shoots inserted in pots of sand and peat, with bottom heat, in a close, warm case.

MEDLAR.—The fruit of the Medlar is not in great

demand. The trees are usually budded or grafted on stocks of the Pear, Quince, Whitethorn, or Medlar, raised from stratified seed.

MELIANTHUS (HONEY FLOWER).—For sub-tropical gardening *M. major* is raised from seed sown in heat in February. Cuttings in spring also strike freely if placed under bell-glasses in a warm house.

MELON.—Seeds for the first crop are sown about the middle of January, and at intervals of three weeks for successional crops, by those who have all modern conveniences for Melon culture. Where hot-beds and pits and frames have to be relied on and the lights raised or moved to give the necessary attention, March or April is soon enough to sow the first pots of seed.

MENYANTHES.—The pretty native fringed-flowered *M. trifoliata* (Bog Bean) can be easily established at the margins of ponds and lakes or in boggy places by planting divisions of old roots.

MERTENSIA.—These beautiful blue-flowered hardy plants, of which *M. sibirica* may be taken as a good representative, thrive in sandy peat, and are propagated by divisions made in autumn or spring.

MESEMBRYANTHEMUM.—Of this large genus there are many very curious and a large number of handsome-flowered and ornamental-foliaged kinds, and they deserve to be much more utilized than they are at present. The annual species, such as *M. crystallinum*, should be sown in heat in March for planting out in June. *M. tricolorum* is best sown in pots or outdoors in a sunny position at end of April. *M. cordifolium variegatum*, so much used in carpet and other bedding, is easily increased by inserting cuttings in pots of sandy soil in rather dry heat of about 60 to 70 degrees in autumn or spring. The shrubby and

herbaceous kinds are propagated by cuttings laid on moist sand or inserted in a mixture of old mortar and sand on a greenhouse shelf. All delight in full exposure to sunshine.

MIGNONETTE.—Of this favourite fragrant subject two sowings should be made—one in April and another in July for autumn flowering. As the seedlings transplant badly, seed should be sown where the plants are intended to flower. For pot culture, sow thinly in 5-inch size in August, and thin out to three or five in each later on.

MIMOSA.—When *M. pudica* (Sensitive Plant) is treated as an annual the seed should be sown in heat in March and the plants grown on in stove or warm greenhouse.

MIMULUS (MUSK AND MONKEY FLOWER).—Propagate the Common and Harrison's Musk by division in February; the Spotted and other kinds by seed thinly covered and by cuttings in spring and summer.

MINT.—Both Spearmint for culinary purposes and Peppermint for distilling are easily increased by dividing the rootstocks in early spring.

MIRABILIS (MARVEL OF PERU).—Treat as a half-hardy annual by sowing seed in a warm frame in March to plant out at the end of May or early in June.

MONARDA (OSWEGO TEA).—Increase by division of the roots in autumn or by seed sown outdoors in April.

MONOCHÆTUM.—These pretty and easily-grown warm greenhouse plants grow readily from cuttings of young shoots, 2 inches or 3 inches long, inserted in a mixture of sand, peat, loam, and leaf-mould under a bell-glass in a temperature of 65 to 75 degrees in spring.

MONSTERA DELICIOSA.—Propagate by stem-cuttings planted in coconut-fibre in a close, hot, moist frame.

MONTBRETIA.—These Cape bulbs are now classed with

the Tritonias, but still retain the old name in gardens. Offsets are freely produced on stolons from the old roots, and these are easily detached and grown on to a flowering size. Seedlings raised in spring grow large enough to blossom in one or two years.

MULBERRY (*Morus nigra*).—The common way of propagating these trees is by layering young branches in autumn; also by cuttings in autumn, selecting for the purpose shoots from the tops of old trees, as they are credited with coming into bearing sooner. From 6 inches to 9 inches is a suitable length, and the base should consist of a portion of two-year-old wood and all the buds except two at the top removed. These are either planted half their length deep in a sheltered, shady border outside or plunged in bottom heat in a frame until rooted. Even long branches will root and grow if planted a foot deep and secured from moving by tying to a stake.

MUSA.—Most of the edible-fruited sorts are seedless, but they are readily increased by suckers thrown up from the root by old plants. *M. Ensete*, so effective in sub-tropical gardening, is raised from imported seed sown in heat in February.

MUSHROOM.—These are raised artificially in cool, dark sheds, cellars, and Mushroom houses by inserting pieces of prepared spawn containing the mycelium in beds of manure that has been partly fermented to dispel its rankness by turning it over at intervals. The material is made firm, and when the heat has dropped to about 85 degrees the spawn, broken into lumps the size of an egg, is planted 2 inches deep and the whole covered with an inch or two of loam, this being beaten firm and level with the back of a spade.

MUSTARD (*Sinapis alba*).—For use with Common Cress this may be sown on the surface of soil pressed level and made moist in shallow boxes and covered with a sheet of glass or piece of slate until germination takes place. The operation should be carried out indoors in cold weather, and outside from May to September. Mustard seeds germinate more quickly than Cress, so that, if wanted for use together, it should be sown three days later than the Cress.

MYOSOTIS (FORGET-ME-NOT).—These favourite spring flowers are easily raised from seed sown outdoors in summer. Choice varieties are perpetuated by division of old plants in spring, and by cuttings inserted under handlights on a shady border in summer. When removing the old plants in spring to make room for the summer occupants, some growers plant a few in a piece of spare ground and obtain later an abundant supply of self-sown seedlings.

MYRICA (WAX MYRTLE AND SWEET GALE).—Hardy evergreen shrubs delighting in a sandy peat soil. They are propagated by cuttings inserted under handlights in a shady position in spring and autumn.

MYRSIPHYLLUM.—The useful sprays of *M. asparagoides*, known to the florists under the name of Smilax, are raised by sowing seed in heat in March and planting out in a prepared bed of loam and leaf-mould in a warm greenhouse, training the growths up string to insure their easy removal when required for cutting.

MYRTUS.—The Common Myrtle and other species of this genus all propagate easily from cuttings of half-ripened new shoots inserted under glass in a close frame during spring and summer.

NARCISSUS.—At the present time these are among

the most popular flowers of our gardens. Their propagation is chiefly effected by offsets, which are freely produced by many kinds, and should be taken off in July or August when dormant. If these are planted in suitable soil and grown on, they flower in one or two years. Seedlings take from three to five and even six years before flowering. The seed should be sown as soon as ripe in pans of sandy loam in a cold frame, and the seedlings transplanted about an inch apart the following year outside in a shady border. Their full merit cannot generally be determined from the first flowers, so that the bulbs should be grown on another season to obtain a true idea of their value.

NASTURTIUM.—See *Tropæolum*.

NECTARINE.—These esteemed fruit-trees are in nearly all cases budded on seedling stocks of Mussel, St. Julien, and White Pear Plum. Care must be taken that a wood and not a blossom bud is selected. In July and August a “dormant” bud, in April and May a “pushing” bud, is used from shoots cut off early in the season and retarded by burying them in sand in a cool north border. Whip and crown-grafting can be done in March, but these methods are seldom resorted to now.

NEMESIA.—*N. strumosa* and its pretty varieties are very desirable plants with abundant flowers of many pleasing shades of colour. The seed should be sown in very gentle heat for either pot culture or planting out in June. Seed may also be sown on a warm, sunny border outside at the end of April or beginning of May.

NEMOPHILA.—The charming blue *N. insignis* and other sorts are easily raised for summer flowering by sowing seed in March or April, and for spring flowering

in August and September. Cats delight to roll in the foliage.

NEPENTHES.—A very high, moist, and close atmosphere is necessary for the successful cultivation of these curious and interesting plants. Cuttings of firm shoots are induced to form roots by turning an empty flower-pot bottom upwards and inserting the base of the shoot through the drainage-hole, so that it may rest on a layer of sphagnum moss in a close, moist, hot, shaded case. When sufficient roots have been emitted, they are transferred to well-drained pots of convenient size in a mixture of two parts fibrous brown peat (well broken up and with all the dust and earthy matter removed) and one part of clean, picked sphagnum moss, kept close and shaded until established. Some obtain considerable success by inserting the cuttings in the Derbyshire spar (used for covering the stages), kept wet in a close, moist atmosphere and high temperature.

With proper convenience and careful treatment, seedlings are easily raised. The male and female flowers, being produced on separate individual plants, must be fertilised. The resulting or imported seed is sown on the surface of pans filled with clean, chopped sphagnum moss and fibrous peat and kept constantly moist in a close, hot case. The seedlings come up at intervals. When large enough to handle, they are lifted carefully and placed in tiny pots in similar compost, and are grown on with heat, shade, and moisture until sufficiently developed to be transferred to an ordinary stove or a Nepenthes house. The drainage in all cases must be so perfect that regular supplies of water may be given and run through the compost, almost like passing through a sieve, without any fear of stagnation, and the plants

must never be allowed to become dry. Frequent syringing with tepid water over and under the leaves is beneficial, as is moderate shade from sunshine. A winter temperature of 65 to 75 degrees and a summer heat of 70 to 85 degrees are needed for success.

NERINE.—If abundant blossoms are desired, these plants should not be frequently interfered with at the roots, but allowed to become to some degree pot-bound. When repotting becomes necessary, in August, just before new growth commences, is the time for removing the offsets, by which these beautiful flowering bulbs are propagated, to grow them on to a flowering size. Seed may be sown in a little heat in spring, but of course seedlings take longer than offsets to reach to flowering strength.

NERIUM (OLEANDER).—Cuttings of these are generally quoted as being amenable to strike root when placed in bottles of water, but except as an experiment it is better to insert them singly in small pots of sandy soil and to place them in a warm frame about April. The roots thus formed are less delicate than when produced in water only.

NERTERA (BEAD PLANT).—*N. depressa* is an exceedingly pretty and quaint little plant when covered with its coral-red berries. It can be grown from seed, but a better way is to plant small rooted divisions in shallow pans of sandy loam and leaf-mould, to place in a little warmth with shade, and to remove to a cool pit or frame when established.

NEW ZEALAND SPINACH (*Tetragonia expansa*).—Although not so palatable as ordinary Spinach, this is useful as a substitute in a hot, dry season. It is not so liable to run to seed, and is a vigorous grower. The

seed should be steeped in water for twenty-four hours, then sown about the end of March in a warm frame, and a few of the seedlings potted up and grown on for planting outdoors when danger of frost is past.

NICOTIANA (TOBACCO PLANT).—The favourite sweet-scented *N. affinis* and other kinds are raised from seed sown in gentle heat in February and treated as other half-hardy annuals for planting out at the end of May or early in June, according to the weather.

NIGELLA (LOVE-IN-A-MIST, DEVIL-IN-THE-BUSH).—The pretty *N. damascena*, *N. hispanica*, and the attractive variety Miss Jekyll should be sown where intended to flower in March or April and the young plants thinned out to about 6 inches apart.

NUTS.—For planting in woods, the Common Hazel-nut is raised from seed that have been stratified and protected from mice and sown in nursery rows in spring. To insure the production of approved sorts of Filbert and Cobnuts, rooted suckers are taken off in autumn, shortened back, and planted. Layers are also pegged down in autumn and winter, and become sufficiently well rooted, if covered with a few inches of soil, for removal the following autumn. Whip-grafting old trees of inferior kinds with improved varieties is done in February and March.

NYMPHÆA (WATER LILY).—Propagation of these lovely aquatic plants can be effected by dividing the tubers just as growth is about to start, also by seed sown in pots of loam and immersed just below the surface of the water in spring. As the seedlings grow and increase in strength the water should be gradually raised, or the pots sunk more deeply, with the leaves floating on the surface.

CENOTHERA.—Plants of this genus, consisting of annuals, biennials, and herbaceous perennials, including those called in gardens Godetias, are among the showiest of hardy border flowers. The annual sorts can be raised from seed sown in April where they are to flower, and the biennials a little later for flowering the following year. The perennials are increased without difficulty by seed, by rooted suckers, and by cuttings of young shoots under a handlight in spring.

OLEARIA.—These flowering shrubs, of which *O. Haastii*, the Daisy-bush of New Zealand, is a well-known example, are increased in September by cuttings of half-ripened shoots inserted in sandy soil under hand-lights or in a cold frame, with shade, until rooted. Layering is also practised by pegging tongued shoots down in autumn.

OMPHALODES (VENUS'S NAVELWORT).—Propagate by sowing seed in April and by dividing the roots of perennial sorts in autumn and spring.

ONION.—The main crop should be sown during dry weather in March by making shallow drills 1 foot apart and thinly covering with fine soil, which, if light and dry, should be made firm by treading or rolling. Another sowing is made in August in rather deeper drills to provide the winter or spring Onions. Silver-skinned sorts for pickling may be sown rather thickly, broadcast, in April. Small bulbs being preferred for this purpose, they need not be thinned. Potato or Under-ground Onions, largely grown by cottagers, are planted shallow (about half their depth) in February, 10 inches apart, in rows 15 inches asunder. They produce a good crop of offsets fit to harvest early in September.

OPHIOPOGON.—The variegated varieties so much used

for decorating are propagated by division in spring, and grow well in a cool house in sun or shade.

ORCHIDS.—Owing to the different habits and manner of growth of these gems among flowering plants, some can be easily, if not rapidly, increased, while with others the process is very slow. With Dendrobiums, Cattleyas, Calanthes, Cymbidiums, Cypripediums, Masdevallias, and many other genera, the most usual method is by division of the pseudo-bulbs or side-growths, which is successfully practised just as growth is about to commence. Formerly the fertilisation of Orchids and raising them from seed were rarely carried on, but these operations are now common with growers who make a speciality of their culture. The raising of seedlings presents problems of interest not only to the gardener, but also to the biologist. By some it was observed that the minute seeds germinated and grew better when sown on the surface of the compost in which a parent plant was growing. It is now understood that with the roots Orchid Mycorrhiza, a fungus, grows in symbiosis or beneficial partnership analogous to that observed in Lichens, and unless this is present in the compost growth is unsuccessful. From that discovery we learn that some compost or pieces of roots from established plants should be mixed with the material used when sowing the seed, to insure the presence of the Mycorrhiza for the mutual benefit of the partnership. In their native habitats, seedlings of some species in all stages of growth may be seen growing on the débris collected in the chinks of rocks and branches of trees. Cultivators here in some measure imitate this by filling pans with the débris from peat and moss, making it wet and scattering the seeds thereon. It must not be allowed

to become dry, so a spray as fine as dew is used to avoid washing the seed away. Disas and Cypripediums are, perhaps, the easiest to handle in this way and the quickest to flower, but in all cases great care and unlimited patience are needed.

ORNITHOGALUM.—Of these bulbous plants the Star of Bethlehem (*O. umbellatum*) and the cottage window Onion Plant (*O. longibracteatum*) are well-known but not by any means the most beautiful examples. Offsets from the old bulbs are generally relied on for propagation, and in some kinds they are very freely produced.

OROBUS.—Plants of the Vetch family, useful in borders and on the rockery. All are increased by division in spring and by seed sown in April.

OSMANTHUS.—These beautiful shrubs of the Olive family can be propagated by cuttings of half-ripened shoots inserted in a cold frame in autumn, or by grafting on stocks of Oval-leaved Privet.

OSTROWSKIA.—*O. magnifica*, considered to be one of the finest of large-growing hardy perennials, is propagated by seed sown as soon as ripe in pots of light sandy soil in a cold frame; also by root-cuttings, 3 inches long, planted in a sheltered, sunny position in September.

OUVIRANDRA (LATTICE-LEAF PLANT).—This most singular and always interesting submerged aquatic plant is successfully grown in a stove temperature with somewhat subdued light. Rain-water is used for preference, though tap-water that has been exposed and warmed answers very well. Propagation is easily effected by simply dividing the crowns, potting them in loam, and returning them to the water before they become dry.

OXALIS.—The cultivated annual kinds are increased

by seed, the perennials by division, and the tuberous-rooted kinds by offsets.

PÆONIA.—Herbaceous sorts are propagated by dividing old clumps in March or April. Tree or Moutan kinds are increased by grafting flowerless shoots on roots of *P. albiflora* and *P. officinalis* in August; these, after potting, should be plunged in soil in a cold frame, heaping up the soil so as just to cover the graft, keeping close and shading until a union is effected, then gradually admitting ventilation. The herbaceous species come true from seed sown when ripe in cold frame.

PALMS.—These grand and elegant plants are nearly all raised from imported seed sown soon after arrival. Those with very hard shells should be soaked to hasten sprouting. A common practice where large quantities are raised is to spread them out in single layers in pans, and to maintain them in a state of saturation with moisture on a hot-bed or over the hot-water pipes, where they can be kept constantly warm but not so hot as to injure the embryo. As soon as any show signs of germinating they are picked out daily, care taken not to injure the tender growth, planted separately in small pots of loam and leaf-mould, and afforded bottom heat to encourage growth. When only a few are to be handled, filing through the shell before sowing will hasten germination. Palms of tufted growth, such as *Rhipis*, are also propagated by taking off rooted suckers and potting them in spring or summer.

PANCRATIUM.—Many of the bulbous plants grown in gardens under this name are now called by botanists *Hymenocallis*. They all increase by offsets and seed.

PANDANUS (SCREW PINE).—There are few, if any, handsomer foliage plants than the variegated *P. Veitchii*,

which is easily propagated by offsets or suckers. These can often be induced to form roots by earthing up the stems of old plants. A sharp knife should be used, and if a thin slice of the old stem can be shaved off, so much the better. After trimming by removing the lower leaves, the offsets should be inserted, not deeply, in small pots of very sandy soil, plunged in bottom heat of about 75 degrees, and only enough water supplied to keep the soil from becoming dry. If at all top-heavy, they should be kept steady with three flower-sticks and a piece of matting twisted round. *P. Sanderi* and *P. utilis* may be similarly treated.

PANSY.—Sow seed in gentle heat in February for raising plants to flower the same year, and outdoors in July for flowering the following spring. Cuttings of side-shoots of choice kinds strike readily in a cold frame in August. Old plants may be divided in September.

PAPAVER (POPPY).—Sow seed of the annual kinds, such as the pretty Shirley Poppies, outdoors in April where they are to grow and blossom. Perennial kinds are increased by seed also, but division of the roots in March insures obtaining the choice varieties true to name. *P. orientale* and varieties will also grow from root-cuttings inserted in sand under glass in autumn.

PARSLEY.—Make an early sowing of the Curled Parsley in February, another for the general supply in April, and a third in July for winter use.

PARSNIP.—Sow early in March in shallow drills 15 inches apart in ground that has been deeply dug or trenched. Thin out finally to 12 inches apart in the rows.

PASSIFLORA.—These favourite climbers can be raised from seed, when obtainable, sown in spring, or by

cuttings of young shoots taken off with a heel and inserted under a bell-glass in heat at the same season, also by pegging down layers in summer.

PEACH.—For propagation, see Nectarine, p. 151.

PEAR.—Budding in July and August has now become very general. Whip-grafting young stocks in March and April, and crown and cleft-grafting old trees of inferior or undesirable varieties, are, as with Apples, the usual means adopted for propagating, using stocks of seedling Pears for standard trees and Quince stocks from cuttings or layers for dwarfs. Some varieties are induced to fruit much better by double-grafting.

PEAS.—Sow dwarf early sorts on a south border in February or March for first crop; for main crop and successions at intervals of three weeks; round-seeded and Marrowfat varieties from March to June. Protect the seed from mice by setting traps, and the young seedlings from sparrows by netting if necessary.

PELARGONIUM.—The Zonal varieties can be readily propagated by cuttings, the best times being in spring under glass and at the end of summer outdoors. The lower leaves and stipules should be removed and cut just below a joint, then inserted in pots or boxes of sandy soil. The greenhouse Show and Fancy sorts are raised from cuttings struck from the tops of cut-back plants inserted in a cold frame in August. The Scented-leaved and Ivy-leaved kinds strike more quickly if afforded a little heat in a close frame in spring. All kinds can be raised from seed sown in gentle heat in spring, but the varieties do not come true to name. Stout root-cuttings, 1 to 2 inches long, planted in sand or sandy compost in a little warmth provide another means of increase.

PENNYROYAL (*Mentha Pulegium*).—Only an occasional demand is made for this herb for culinary purposes. It is easily increased by divisions in autumn or spring, planted in a cool, moist soil in a partially shaded position.

PENTAS.—These pretty stove flowering plants propagate easily by cuttings of young shoots in close, moist heat in spring and summer.

PENTSTEMON.—These handsome flowering plants for beds and mixed borders can be raised from seed sown in gentle heat in March, or outdoors early in June. Cuttings made from side-growths of choice sorts strike freely in August in a cold frame, where they should remain for protection throughout the winter, being planted out the following April.

PERILLA.—A good time to sow the seed of this coloured-leaved half-hardy annual is the middle of March, in a little warmth, for planting out in May.

PERNETTYA.—The pretty and various-coloured berries of *P. mucronata* come in for a full share of admiration at our autumn and winter exhibitions. The berries, when quite ripe, should be rubbed up in silver sand to remove the pulp and be sown in sandy peat in a cold frame and kept constantly moist. Shoots are also layered in March.

PETUNIA.—Sow seed in gentle warmth in March, and prick out the young seedlings in pans or boxes as soon as big enough to handle. Young shoots of choice sorts strike root readily in a close frame in spring or autumn.

PHACELIA.—The pretty blue-flowered *P. campanularia* and *P. tanacetifolia* should be sown in April on a sunny border where they are intended to flower.

PHILADELPHUS (MOCK ORANGE).—The many handsome species and varieties of these free-flowering shrubs may be propagated by rooted suckers taken off in autumn or early spring and by cuttings of young shoots inserted under glass in close warmth in April.

PHLOX.—Dwarf kinds like *P. subulata* grow readily from cuttings in a cold frame in July if shaded from sunshine. Another way is to shake some fine soil among the growths in summer, to keep it moist to induce roots to form, and to divide the rooted portions in autumn. The tall perennial sorts can be divided in autumn or spring. Some prefer to make cuttings of healthy shoots from the base, inserting them in sandy soil in a cold frame in spring. Root-cuttings (short lengths) are also used and treated like seed. *P. Drummondii* should be sown in a little heat in March, and the seedlings pricked out in boxes when big enough to handle for planting out in May.

PHORMIUM (NEW ZEALAND FLAX).—These are usually propagated by division just before growth commences in spring and by seed sown in February in greenhouse or warm frame.

PHYSALIS (WINTER CHERRY).—*P. Francheti* is the most vigorous grower; it has very large fruit, and is extensively grown for the inflated red calyces. Both it and *P. Alkekengi* are easily raised from seed sown in gentle heat in March for planting out in May. Root-cuttings and divisions also succeed very well. *P. peruviana edulis* (Cape Gooseberry) may also be raised from seed sown in heat in February for pot culture in the greenhouse or on the back wall of the vinery.

PICOTEE.—For propagation, see Carnation.

PILEA.—*P. microphylla* (syn. *P. muscosa*) is pretty as

a pot plant grown in loam, leaf-mould, and sand. It will also thrive as an edging to greenhouse stages if planted in moist broken coke or gravel. Cuttings strike readily in spring in warmth.

PINEAPPLE (*Ananas*).—Both those sorts grown for fruit and those with variegated foliage are raised from suckers, and sometimes the crowns of the fruit are used. A few of the lower leaves should be removed, and after potting in fibrous loam they should be plunged in a brisk bottom heat and water given sparingly until roots are plentiful.

PINKS.—These old favourites may be propagated like Carnations, but pipings are generally used. These are young shoots pulled from the base of the old plants after flowering. A few of the lower leaves are removed, the bottom end is cut through close below a joint, and the pipings are inserted in prepared sandy soil in a shady border and covered with a hand-glass until rooted.

PLEROMA (*Tibouchina*).—Cuttings of these beautiful blue and purple flowering Melastomads root readily in bottom heat during summer if covered with a bell-glass.

PLUM.—Shield-budding in July and August is the method generally employed on stocks of Damson, Mussel, St. Julien, and White Pear Plum. Grafting, if desired, may be done in March. The stocks should be headed back early in the year, and the shoots intended for the scions cut at the same time and laid with their ends in the ground in a cool place to retard them. Wood buds (not blossom buds) must be used in all cases.

PLUMBAGO.—The beautiful greenhouse climbers *P. capensis* and its white variety are propagated by cuttings of young shoots, 3 or 4 inches long, taken off with

a heel of the old wood, inserted in pots of sandy soil surfaced with a thin layer of pure sand, and plunged in bottom heat in a close frame in March or April. The winter-flowering *P. rosea* and its improved form, *coccinea superba*, may be similarly treated.

POINSETTIA.—See *Euphorbia*.

POLEMONTIUM.—These easily cultivated and mostly blue-flowering border plants, commonly known as Jacob's Ladder, are easily increased by division in autumn or spring.

POLYANTHUS.—The seed of these favourite spring-flowering plants should be sown in summer as soon as ripe in an outside border, partially shaded and moist. Choice sorts are perpetuated by division in autumn.

POLYGONATUM (SOLOMON'S SEAL).—Easily increased by dividing the roots in October or March.

POLYGONUM.—The annual kinds are raised by sowing seed in spring; the perennial species by division in autumn or spring.

POMEGRANATE (*Punica granatum*). — The single-flowered sorts may be raised from seed; the double forms and other choice varieties from cuttings, suckers, layers, and grafting on seedling stocks of the common kind in March.

PORTULACA.—Those of the *grandiflora* type grown as half-hardy annuals for border flowers may be sown either indoors in March for planting out later on, or outdoors in light, dry soil at the end of April. Exposure to full sunshine is absolutely necessary for the full development of the brilliant flowers.

POTATO (*Solanum tuberosum*).—The Potato may be raised from seed or cuttings. As is well known, the planting of tubers, either whole or cut into pieces each

containing one or more eyes, is the general plan for obtaining a crop. A good, friable, well-drained loam is considered best suited for their culture. Selecting for the purpose an early variety such as Improved Ash-leaf Kidney, the first outdoor crop should be planted not later than the middle of March on a warm, sheltered south border. The end of March or early in April is a good time to plant the main crop.

POTENTILLA.—The hardy herbaceous perennial kinds are propagated by division in autumn and spring, and by seed sown about the middle of March.

PRIMULA.—There are now several different forms of *P. sinensis*, of which *P. stellata* is very popular owing to its free habit and profuse flowering propensity. The seed should be fresh and sown in well-drained pans filled with a mixture of two parts loam, two parts leaf-mould, and one part silver sand, sifted through a $\frac{1}{4}$ -inch sieve, pressed down lightly and level, watered, and allowed to drain. It is then ready for sowing the seed thinly and evenly over the surface, to be covered with a very thin layer of the fine compost, placed in a warm frame, and covered with a pane of glass until the seedlings appear. When big enough to handle, prick off in pans of similar compost, keep close and shaded for a few days; in due course transfer singly into small pots and grow on in a cold frame, the pots standing on a bed of coal ashes.

The double varieties are considered difficult to propagate and to cultivate, but we have known men who grew them, as expressed by the old saying, "like weeds." They are propagated by cuttings taken off the base of old plants with a heel, planted singly in small pots, surrounding the base of each cutting with pure silver sand, the leaves tied to a stick to keep all steady,

plunged in a bottom heat of 75 degrees, watered, the foliage allowed to dry, then kept close and shaded until rooted. Some remove a few of the bottom leaves from old plants after flowering and earth up the stems to induce roots to form, so that the cuttings may be taken off already rooted. They flourish better when afforded a little more heat than is required by the single kinds.

The hardy Primroses grow freely from seed sown soon after ripening, but old seed will sometimes lie dormant for a year before germinating. Choice named varieties are divided, by which means their distinctive characters are retained.

PRUNUS.—Many of the ornamental species of this genus can be propagated by cuttings of tolerably firm shoots inserted in pots of sandy soil in a cold frame in autumn; by budding on stocks of the Common or Myrobalan Plum in July and August, and by layering branches in autumn and spring.

PULMONARIA (LUNGWORT).—These border perennials are easily increased by division in early spring.

PYRETHRUM.—Closely allied to Chrysanthemums and much grown for cut-flowers, a large number of beautiful varieties are mostly increased by division of the roots in March and by seed sown in gentle heat about the same time to provide material for planting out in June. Golden Feather seed is sown in a little warmth in March, and when big enough pricked out in boxes to be hardened off for planting out in May.

PYRUS.—The many ornamental kinds of this genus, grown for their abundant blossoms and bright-coloured fruits, are propagated by seeds, cuttings, budding, and grafting, like Apple and Pear-trees.

QUINCE.—Cuttings with a base portion of two-year-old wood will root and grow if planted in the open ground in autumn. Quinces are also increased in October by layers from old stools cut down and kept for that purpose.

RADISH.—Seed may be sown from December to March, broadcast, on slight bottom heat, in frames or among other forcing crops; in March and onwards outdoors about every fortnight. Winter Radishes are sown in July and August. Birds being very fond of the seed, all outside sowings should be protected.

RANUNCULUS.—The garden forms of *R. asiaticus* are propagated by seed sown in spring and by dividing the tuberous roots at planting time; the hardy herbaceous kinds by division in October or March.

RASPBERRY.—Unless it is desired to raise new varieties from seed or to increase special sorts by cuttings, propagation is effected solely by rooted suckers, transplanting them in October or November, and getting the roots covered with soil quickly to prevent damage by drying. The canes should be cut down to within a foot of the ground to encourage strong growths to spring up in the summer and to produce fruiting canes for the following season.

REINWARDTIA.—*R. tetragynum* and *R. trigynum* (syn. *Linum trigynum*) are showy free-flowering sub-shrubs for the warm greenhouse. They are easily propagated by cuttings of strong shoots from old plants inserted in a close frame with bottom heat in April or May. Frequent syringing of the growing plants is recommended to keep red spider in check.

RHODODENDRON.—Various methods are adopted for propagating the many species and varieties of this large

and popular genus, including seeds, cuttings, layers, and grafting. The minute seeds are sown in well-drained pots or pans of sandy peat, the surface is made smooth and level, watered, and allowed to drain. The seeds are then scattered thinly and very lightly covered. A cold frame is a suitable place for the hardy sorts, but a higher temperature is needful for stove and greenhouse kinds. When big enough to handle, the seedlings are pricked off in pans of similar compost and shaded.

Cuttings are made of moderately ripened shoots inserted in pots of sandy peat in a close case, with a slightly higher temperature than that in which they have been growing. When callused a little, bottom heat assists the formation of roots. Side-grafting on suitable stocks of free-growing kinds is done in autumn, but greenhouse hybrids, such as Princess Royal, succeed best when worked in winter. They require to be kept in a close case and shaded until a union is effected, and afterwards gradually inured to more ventilation. Layering of hardy sorts is considered to be best done in October or November.

RHUBARB.—Division of the roots with a clean, sharp spade can be effected from November to February, at least one crown or bud being attached to each portion, and this is the quickest method of propagating. Seed, if sown in March outdoors, will, with high cultivation, produce stems fit for use in one or two seasons.

RHUS.—Some of the hardy Sumachs are very ornamental and may be propagated by ripened shoots made into cuttings in September, also by layering branches in autumn. Such species as *R. glabra laciniata* can be readily increased by stout root-cuttings, 3 inches long,

inserted with the tops just below the surface in sandy soil in a cold frame in autumn and winter.

RIBES (FLOWERING CURRENTS).—Increase by cuttings of ripened shoots about 6 inches long firmly inserted to half their length in sandy soil outdoors in September, and by rooted suckers in autumn and winter.

RICHARDIA.—Propagate by division and by suckers and offsets taken off when repotting or planting out, also by seed sown in heat when ripe.

RICINUS (CASTOR-OIL PLANT).—Sow seed in heat in March, grow on under glass, and harden off for planting in a sheltered, sunny position early in June.

RIVINA.—*R. humilis*, cultivated for its racemes of bright scarlet berries, is readily propagated by seed sown in a temperature of 65 degrees in spring, and by cuttings at the same season.

RONDELETIA.—Strike cuttings when the shoots have lost their succulent nature and become somewhat firm, by removing the lowest pair of leaves, cutting smoothly just below a joint, inserting them in pots of sandy soil, and plunging in bottom heat under a bell-glass in a temperature a little higher than that in which they have been growing.

ROSEMARY (*Rosmarinus officinalis*).—The species and varieties of this odorous dwarf shrub can be propagated by cuttings, 4 inches to 6 inches in length, inserted in a shady border in April or May, or by rooted slips detached and planted where intended to be grown.

ROSES.—Nearly all the known methods of propagation may be practised with the various species and varieties of this popular flower. The most used are whip-grafting in close heat in January, and budding, which have been explained in a previous chapter.

Cuttings are very extensively employed. The perfectly hardy kinds should be made of shoots of the current season's growth from 9 inches to 12 inches long. If with a heel of the old wood, so much the better; if not, cut the lower end smoothly just below a joint with a sharp knife, leave all buds intact, and plant the cuttings firmly to half their length in a north border outdoors from August to October. They will callus during winter, and in spring emit roots, and thus be fit for transplanting in one year. Tea-scented and tender kinds should be inserted in pots of sandy soil and given protection under glass in winter, during which time they will become callused, and on bringing them into a little warmth in spring roots will be quickly encouraged to grow. Shoots from plants that have been forced supply excellent material for cuttings, which, of course, may be put in earlier. The sooner cuttings are inserted after they are made and before they have had time to dry the greater is the promise of success.

Layering is done by pegging down shoots that have been tongued through a joint in early summer. Such are generally sufficiently well rooted for removal in the following autumn.

Division in February answers very well with such as the Fairy Rose and Scotch Rose if care be taken to see that each portion is furnished with roots.

Suckers of kinds growing on their own roots can sometimes be taken off with roots and replanted.

Propagating from seed is only adopted by those desiring to raise new varieties or for growing seedling Briars for stocks. The hips, whence the seeds are obtained, should be fully ripe. Some growers rub them in sand to remove the pulp and separate the seed and

sow at once. It is more usual to bury them in sand until spring, when the seed can be taken out and sown in shallow drills outside or in pans in a cold frame. Germination is usually very slow and irregular; some may come up the first season, and others not until the second year. The first flowers produced are no indication of what the worth of the plants may be, so they should be grown on for another season to obtain a proper estimate of their value, or be budded on healthy stocks to hasten their development.

RUBUS.—The ornamental kinds, like those grown for their fruits, are propagated by cuttings, suckers, and division; also by pegging down the tips of long growths in July.

SAGE.—This herb, which is in frequent demand, may be raised from seed sown in March in gentle heat to plant out in May. Cuttings of growing shoots will root in sandy soil under a hand-glass on a shady border in spring. The easiest and most general plan is to pull off rooted slips and to plant them in a warm, dry border in April or September.

SAGITTARIA (ARROW-HEAD).—Plants suitable for growing in marshy ground and in shallow ponds are obtained by dividing old ones in March or April.

SAINTPAULIA.—The charming little warm greenhouse plants *S. ionantha* and its varieties, sometimes called African Violets, are raised from seed similarly treated to those of *Streptocarpus*. Mature leaves treated like leaf-cuttings of *Gloxinia*s will also grow.

SALPIGLOSSIS.—Sow seed of these beautiful half-hardy annuals in gentle heat about the middle of March, and plant out in a sheltered, sunny position early in June.

SALSASY AND SCORZONERA.—Sow the seed in deep,

rich soil—ground that was manured for a previous crop, but which has had no fresh manure since. About the middle of April is a good time. If sown too early the plants are apt to run to seed. Let the drills be 1 foot apart, and thin the seedlings out to a distance of 9 inches apart in the rows.

SALVIA.—Most of the species and varieties of this vast genus can be readily propagated by cuttings of young shoots inserted in spring in sandy soil, kept close and shaded until rooted; the annual sorts by seed sown in March, either indoors or outside, according to their nature.

SAMBUCUS (ELDER).—The hardy herbaceous kinds are increased by division in autumn or spring; the shrubby species and varieties by cuttings of ripe shoots outdoors in October or March.

SANCHEZIA.—These ornamental-foliaged stove plants are readily propagated by cuttings of tops or side-shoots in spring or summer.

SAPONARIA.—*S. calabrica* and its varieties are sown in April for summer flowering, and in September for spring bedding.

SARRACENIA.—These interesting North American Pitcher Plants are propagated by division of the crowns just as growth is commencing, potting them in fibrous peat, with most of the dust and earthy matter removed, mixed with sphagnum moss and a few lumps of charcoal. They are then placed in a cool, moist, shady position in the greenhouse and are frequently syringed overhead.

SAVORY.—Summer Savory (*Satureia hortensis*) is an annual. Seed for an early supply is sown in gentle heat in March, and the seedlings are planted out on a warm,

sunny border in May. Another sowing is made in rows 1 foot apart about the middle of April in a warm, sheltered situation outside, thinning the young seedlings to 6 inches apart in the rows.

Winter Savory (*S. montana*), a dwarf, hardy, evergreen sub-shrub, can be raised from seed and cuttings, but is usually increased by divisions planted 1 foot apart in March or April.

The aromatic tops of both are often in request for flavouring and seasoning culinary preparations.

SAXIFRAGA.—Most of this large genus can be readily propagated by seed sown in spring or by division, a few by cuttings, and such as *S. sarmentosa* from runners.

SCABIOSA.—The Sweet Scabious (*S. atropurpurea*) and its many varieties succeed well treated as annuals by sowing seed in gentle heat in March and transplanting the seedlings outdoors in May. Seed may also be sown outside in April to bloom in autumn. The beautiful *S. caucasica*, considered one of the best hardy perennials in cultivation, it being excellent either for border or for cut-flowers, can be raised from seed, or the clumps may be divided in October or March.

SCHIZANTHUS (BUTTERFLY OR FRINGE FLOWER).—For pot culture, sow *S. grandiflora* hybrids, *S. retusus*, and *S. wisetonensis* from August to September for flowering the following spring, and from February to April for summer flowering. Prick off when the seedlings are big enough to handle, and grow on with cool greenhouse treatment. *S. pinnatus* and its varieties may be sown indoors in March to plant out on a sunny border in May.

SCILLA.—Owing to the long time plants from seed, sown as soon as ripe, take to reach flowering size.

(from three to four years), offsets from old bulbs are the usual means of propagation.

SCORZONERA.—See Salsafy.

SCUTELLARIA (SKULLCAP).—*S. muciniana* is a very pretty bright scarlet-flowering stove plant. Cuttings of rather firm shoots strike readily in spring. The hardy species are increased by seed and division.

SEAKALE.—A very general method of propagating this is by root-cuttings. When lifting large roots for forcing, cut off the side-roots, or thongs, from 4 inches to 6 inches long, cut the top straight across and the lower end slanting, tie in bundles, and bury in sand until April; then plant with the tops just below the surface in rows 2 feet asunder and 18 inches from each other in the row. Seed is also used, and sown at the end of March or early in April in drills 1 foot apart, the seedlings being thinned to 6 inches apart. Lift the roots in the following February, cut off crowns and buds to check them from running to flower, and replant 18 inches apart in rows 2 feet asunder. But if for forcing under pots where growing, the plants should be 2 feet apart and the rows 2½ feet asunder.

SEDUM.—Most of the Sedums can be easily increased by seed, cuttings, or division in spring. *S. spectabile* and its handsome varieties are worth growing not only for their abundant heads of blossoms, but also for their attraction for the beautiful Peacock Butterfly, which is an added beauty when hovering with expanded wings in the sunlight.

SELAGINELLA.—The propagation of these is generally very easily accomplished by division, and especially by cuttings or small pieces of non-fruiting growth detached and planted in light sandy compost and kept moist and

shaded. Spores are produced, but for practical purposes are seldom used, this being a slow process.

SEMPERVIVUM.—The general method of propagation is by removing the young offsets from around the bases of old plants, or by seed sown in spring in a mixture of loam, leaf-mould, and old mortar. Leaves and cuttings will also grow if slightly dried before insertion.

SHALLOTS.—Plant at the end of February, 6 inches apart, in rows 9 inches asunder, pressing the cloves into the soil to keep them in position and so that the crowns just appear above the surface. When ripe and the leaves turn yellow in July the Shallots may be taken up, dried in the sun for a few days, and stored.

SILENE.—Sow *S. pendula* in August or September for spring gardening outdoors, and in April for summer flowering. Perennial kinds are increased by seed sown in spring and by division in March and April.

SKIMMIA.—The seed, when ripe, should be cleaned from the pulp and sown in pots of sandy loam and peat in a cold frame. Firm cuttings root in gentle heat under bell-glasses in summer. To insure the production of berries, which are a special feature of these evergreen shrubs, plants of both sexes should be grown in close proximity.

SOLANUM.—Of this large genus the annuals and many of the perennials may be grown from seed, the tuberous-rooted kinds from tubers and seed, and the shrubby species by cuttings and seed.

SOLIDAGO (GOLDEN ROD).—Divide the roots in autumn or spring.

SONERILA.—These gems of foliage plants are raised from seed and by cuttings inserted under a bell-glass in a moist temperature of 85 degrees. Leaves (as a

curiosity) will also grow and produce young plants. The compost in which they thrive best consists of fibrous and chopped sphagnum intermixed with small pieces of crushed brick and charcoal.

SORREL (*Rumex acetosa*).—This is a native plant and the only species of the genus usually grown in English gardens (for the leaves, used in salads). It may be raised by sowing seed in March or by division of the clumps in early spring.

SPARMANNIA.—Both the single and the double flowered forms of this favourite greenhouse shrub are easily increased by cuttings in close heat in spring.

SPINACH.—The Round or Summer Spinach should be sown at intervals from February to May, according to the demand. For winter and spring use, one sowing of Long-Standing Prickly should be made early in August and another in the middle of September. If the summer crops are sown in single drills between rows of Peas, some shade is obtained, and they are not likely to run to seed so quickly. Spinach Beet may be grown like ordinary Spinach.

SPIRÆA.—Propagate the herbaceous kinds by division in autumn or spring; the shrubby sorts by green cuttings of young shoots in summer, kept close and shaded until rooted; also by root offsets (of the species which produce them) in autumn.

STATICE (SEA LAVENDER).—Annuals, biennials, and perennials can all be raised from seed, provided that such is obtainable. Most sorts germinate better in gentle heat. *S. Bonduelli* and *S. sinuata* varieties do well treated as half-hardy annuals, large quantities being thus grown for market and called everlasting flowers, on account of their durability when dried. *S. Suworowi*,

a hardy annual, is another species extensively raised for market by sowing the seed in gentle heat in March and planting out in May. The favourite greenhouse hybrid, *S. profusa*, is grown from cuttings inserted singly in small pots in spring in a close temperature of about 60 degrees. Root-cuttings of the perennials are also used.

STEPHANOTIS.—The *S. floribunda* Elvaston variety is more compact and floriferous than the typical species, and cuttings of short-jointed side-shoots of the previous year's growth, about 3 inches or 4 inches long, strike readily when inserted in sandy soil in a close case with a bottom heat of 75 to 80 degrees.

STOCKS.—Ten-week Stocks should be sown in gentle heat at the end of March and in April, ventilating freely when the seedlings grow up, pricking off in boxes, and transplanting outdoors during showery weather at the end of May in rich, moist soil. Seed may be sown outdoors in April.

The Night-scented Stock may also be sown in sunny situations outdoors in April where intended to bloom. The flowers are not handsome, but they exhale a delicious fragrance in the evening.

Intermediate and East Lothian Stocks should be sown in August, and the seedlings wintered in a cold frame to plant out or to grow in pots in March. Seed, if sown indoors in February or March and planted out in May, will blossom in autumn.

Brompton Stocks succeed when sown in June or July to plant out in a dry, well-drained border in a sheltered situation in September, or they may be kept in a cold frame through the winter in less favoured districts and planted out in March.

Virginian Stocks are very easily grown by sowing the

seed from March to June in drills or masses where intended to bloom.

STRAWBERRY.—The ordinary or large-fruited kinds are increased by runners, which root readily around old plants. Better plants are obtained by pegging or securing in position with a small stone the first plantlet in pots, pinching off any further growths to confine all the energy to the pot plant. These, if kept watered in dry weather, soon fill the pots with roots, when they may be cut away from the parent and either planted out to form new beds or grown on for forcing in larger pots. Should there be a scarcity of pots, turves laid grass side downwards may be substituted, and answer the purpose very well. The alpine varieties give excellent results when raised from seed washed from the pulp of ripe fruit and sown at once, or dried and sown in spring either on a sheltered border outside or in pans and boxes stood on a gentle hot-bed. A little warmth will hasten growth, and after planting out the seedlings will fruit in autumn.

STREPTOCARPUS (CAPE PRIMROSE).—The beautiful hybrid varieties of *Streptocarpus* are excellent greenhouse plants with a wide range of colour and an extended season of abundant blossoms. Seed should be sown in January or February in pots of fine sandy compost that has been pressed moderately firm, watered, and allowed to drain for an hour. When the fine seed has been thinly scattered over the surface, a little silver sand sprinkled over—barely enough to cover them—is all that is needed. Cover with a sheet of glass and place in a shady part of a house with a temperature of 65 to 70 degrees. Prick off the seedlings when of nice size for handling, and transfer to 3-inch pots when

making a second leaf. An intermediate house temperature is desirable while in a young state, but when well established they do very well in cold frame or ordinary greenhouse. The young seedlings may be expected to commence flowering in July and August. Special sorts are best increased by leaf-cuttings, planting small pieces with midrib round the margins of pots in a warm house. Young plants will also grow from the base.

SWEET PEA.—See *Lathyrus*.

SWEET WILLIAM.—Sow seed in April in a sunny position outside, thin out and transplant in September to where they are intended to flower the following year.

SYMPHORICARPUS (SNOWBERRY).—Suckers of these are freely produced, and, if taken off with a few roots attached in autumn or spring, are a ready means of propagation. Cuttings of firm shoots, 6 to 8 inches long, may be planted in a shady border in September, and seed from the white berries may be sown when ripe.

TACSONIA.—Propagate by cuttings, about 4 inches long, taken off with a heel and inserted under a bell-glass in spring or summer, or by seed when obtainable.

TAMARIX.—Cuttings of these, taken in September, strike fairly well under a hand-glass in a shady north border.

TARRAGON.—This herb is in frequent request for salads, for seasoning, and for making Tarragon vinegar. Divide the roots and replant in spring. Cuttings taken when growth is commencing will strike with a little warmth.

TECOMA.—Propagated by cuttings of either young or partly-ripened shoots, by layers, and by root-cuttings.

THALICTRUM.—These perennial plants are increased by division in early spring.

THUNBERGIA.—Propagate the annual *T. elata* and varieties by seed sown in a temperature of about 65 degrees in March; the shrubby and climbing stove kinds by rather firm cuttings inserted under a bell-glass in spring and summer.

THYME.—Both the Common and the Lemon Thyme are in frequent demand for culinary purposes. Plants are easily raised by sowing seed in April on a warm, sunny border. If some fine soil is shaken in the tufts in autumn, they can be divided into rooted pieces fit for planting in March or April.

THYRSACANTHUS (THYRSE FLOWER).—This distinct stove flowering plant strikes readily from cuttings inserted singly in small pots in a close, warm frame with bottom heat in spring.

TIGRIDIA.—Once seen, the bright, gay, spotted blossoms of these greenhouse bulbs are never forgotten. Propagation is effected by offsets and by seed. Tigridias will grow in warm districts in sheltered, sunny situations outdoors in summer if planted with a little sand round the bulbs in April.

TILLANDSIA.—The handsome bright-coloured stove species, such as *T. Lindenii*, *T. psittacina*, and *T. splendens*, are all increased by seed and suckers, the latter taken off when they get a little firm at the base. A moist heat of 85 degrees is suitable.

TOMATO.—Sow seed at the end of March or early in April in pots or pans of light sandy soil and plunge in gentle bottom heat. Insert the seedlings singly in 4-inch pots when they have made two true leaves, grow on without check, and harden off to plant out in June. Where special houses are devoted to Tomato culture, other sowings are made in September and again in

January and February. Cuttings for winter and spring crops are not much used now.

TORENIA.—Sow seed of the annual species and varieties in March in a temperature of 70 degrees. All kinds are readily increased by cuttings inserted in a close frame with bottom heat in spring and summer.

TRACHELIUM (THROAT-WORT).—Seed of this old favourite blue-flowering greenhouse plant should be sown either in September in a greenhouse or in March in pots of sandy soil stood on a mild hot-bed.

TRADESCANTIA (SPIDER-WORT). — Propagate the popular hardy *T. virginica* by division in March. The stove and greenhouse cultivated species grow readily from cuttings inserted in porous compost and in moist heat during spring and summer.

TRILLIUM (AMERICAN WOOD LILY).—Carefully divide the rooting rhizomes in September, and plant in a peaty, moist, but well-drained soil in a shady position on the rockery.

TRITELEIA (TRIPLET LILY).—Propagate by offsets removed from old bulbs when potting or planting.

TRITONIA.—Increase similar to the Triteleias.

TROLLIUS (GLOBE FLOWER).—Propagate by division in October or April. Seeds are slow in germinating, but some pretty hybrids have been raised in recent years.

TROPÆOLUM.—The annual kinds, known as Nasturtiums, both dwarf and climbing, are raised from seed sown in April where intended to grow; double and special varieties by cuttings in gentle heat; tuberous-rooted ones by tubers and seed; and *T. speciosum* by seed and division of creeping rhizomes in October or March.

TULIPS.—The general method of propagating Tulips

is by offsets, which some sorts produce freely, others only sparingly. New varieties are raised from seed sown in light sandy soil in a cold frame in February, the seedlings being transplanted outdoors in the following year. They take from four to six years to grow to flowering size, and when the first blossoms open they are not fixed, but in that stage are called "breeders," which in due course break into other colours and markings.

TURNIPS.—The first outdoor crop is sown in March, and small successional sowings are made at intervals until June. In July the main crop may be sown, either broadcast or in drills (the latter for preference) about a foot apart, thinning out the young plants to 9 inches in the rows or according to the strength of the variety.

TUSSILAGO.—The variegated form *T. Farfara variegata* is the only cultivated variety, and is propagated by division in March. The Winter Heliotrope (*T. fragrans*) is now placed with the Petasites, and, although appreciated for its early blossoms and fragrance, becomes a weed when planted in the garden among choice subjects.

ULEX (FURZE, GORSE, WHIN).—The different species are raised from seed. Irish Furze rarely produces seed, but that and the double-flowered variety of *U. europaeus* are propagated by cuttings and grown on in pots to insure safety when transplanting.

URCEOLINA.—The pretty Drooping Urn Flower (*U. pendula*) is increased by offsets carefully taken off when repotting. Seed sown soon after ripening and grown on in loam, peat, and sand in an intermediate house will flower in two years.

UTRICULARIA (BLADDER-WORTS). — The handsome-

flowered *U. montana* and *U. Endresii* are propagated by division just before growth commences, they should be suspended in shallow teak Orchid baskets in fibrous peat and sphagnum moss in a moist stove temperature.

VACCINIUM.—Propagate by layers and seed sown in gentle heat in spring, hardening off before planting out in moist, peaty soil.

VALLISNERIA.—This favourite submerged aquatic for indoor aquaria is interesting on account of the peculiar manner in which fertilisation is effected and the facility and clearness by which cyclosis can be seen when magnified. It is propagated by division and creeping stolons. Female plants are the most vigorous in growth.

VALLOTA (SCARBOROUGH LILY).—Propagate in June and July by offsets from old bulbs, which flower best when seldom disturbed. Seed sown immediately after ripening will grow and flower in about three years.

VEGETABLE MARROW.—Sow seed singly in small pots in a little warmth towards the end of April to harden off and plant out in June.

VERBASCUM.—The garden sorts should be sown outdoors in April.

VERBENA.—Bedding Verbenas can be raised from seed sown in heat in April, and by internode cuttings inserted in a close frame in autumn, and very rapidly in spring, using very sandy compost and brisk, moist heat. The hardy *V. venosa* may be increased by division of the roots in spring and by seed sown in March or April.

VERONICA.—Propagate the herbaceous sorts by division of roots in autumn or spring; shrubby kinds by cuttings inserted in a cold frame in June or July and with a little warmth in spring.

VIBURNUM.—Insert cuttings of half-ripened shoots in a shady border under a handlight or in cold frame in September, or put down layers in October.

VICTORIA REGIA.—Treat this noble aquatic as an annual. Sow in pots in January seed that has been kept in water to preserve its vitality, and submerge 2 inches below the surface in a light position in water kept at a temperature of 85 degrees. Prick out, repot, and transplant as growth proceeds.

VINCA (PERIWINKLE).—Increase hardy sorts by division in autumn or spring; stove sorts by cuttings of young shoots inserted in a close case with bottom heat in spring.

VINE.—The Grape Vine is usually propagated by eyes in January or February, selecting well-ripened shoots with plump buds of the previous season's growth from prunings that have had their lower ends stood in moist soil. They are prepared by cutting the shoot through in a slanting direction $\frac{1}{2}$ inch above and the same distance below a bud, as shown in illustration on p. 33. These are planted horizontally with the bud uppermost, either singly in small pots or several in pans, filled with sand and loam, the top of the bud being just level with the surface soil. They are watered and plunged in a bottom heat of 80 degrees and a top temperature of 65 to 70 degrees. When the buds begin to grow they are very tender and must be sheltered from cold draughts and always watered with tepid water when necessary to keep the soil moist. When roots and a little growth have started (see illustration on p. 33), those in pans are transferred singly into 3-inch pots, grown on with care in a hot, moist atmosphere, shifted to larger pots as growth proceeds, well ripened in

autumn, and stood outdoors in full sun. The best canes are selected for fruiting in pots the following year; those not quite so strong for planting in permanent situations. Any weaker ones are shortened down (called "cut-backs") for growing on to make extra strong canes the next season.

For renovating old, well-established Vines of inferior or undesirable varieties, inarching young growths, using a young Vine in a pot for the scion, is a very successful method. Whip-grafting after the stocks have made a little growth, to prevent bleeding and to draw up the sap to sustain the scion until united, is another plan frequently adopted. Layering by pegging shoots of the previous year's growth in a shallow trench, and, when the new shoots have grown a few inches, filling in the soil, is yet another easy means, as each growth can be taken off in autumn with roots attached; but this mode, and that of propagating by cuttings of ripe shoots, are not much practised in this country.

Some weak-growing varieties have been found to succeed better when worked on stocks of more vigorous sorts, such as Muscat Hamburg on Muscat of Alexandria and Madresfield Court on Muscat of Alexandria or Black Alicante.

VIOLA.—Propagate the tufted Violas by cuttings, which can be obtained in plenty by cutting a few plants over in July. Insert in a shady border under hand-lights; or shorten back in August, work some fine sandy soil among the growths, and divide the rooted portions in September. Divide crowns of Violet (*V. odorata*), discarding those that are old and exhausted, in April, plant out, and keep runners pinched off. Other species may be propagated by runners (restricting the number

to what is required), pegging them down. They soon become well rooted if the ground is kept moist.

WALLFLOWERS.—Propagate the double sorts by cuttings of small side-shoots in pots of sandy soil in a cold frame in August, afford slight protection in winter, and plant out in March. Sow seed of Blood-red and other varieties at end of May. When the seedlings are large enough, prick off or plant out in the flowering quarters in poor, dry soil to restrain over-luxuriance, as plants so treated withstand the rigours of winter better.

WALNUT (*Juglans regia*).—Seeds of the different species of this genus, as well as the Common Walnut, are best sown where the trees are to grow (owing to the taproots they form), either as soon as ripe or in spring after having been stratified in sand or soil. For perpetuating special varieties, seedling stocks are raised and ring or shield-budding, cleft or flute grafting, inarching and herbaceous grafting resorted to.

WATSONIAS.—These desirable flowering plants are propagated by offsets from the corms and by seed.

WIGANDIA.—*W. macrophylla*, perhaps better known as *W. caracasana*, a noble sub-tropical bedding plant, is best treated as an annual by sowing seed in heat in March, growing the seedlings on under glass to plant out in June.

WISTARIA.—The usual method of propagation is by layers in summer, and these are sufficiently well rooted to remove to permanent quarters in a year. Root-cuttings and root-grafting are other methods, and seed, when obtainable, may be sown in spring.

YUCCA.—The hardy kinds are increased by offsets and suckers taken off in March and planted in a warm, sunny, sheltered situation outside. The variegated and

greenhouse kinds by removing the thick fleshy rhizomes (called "knaws"), cutting them into about 2-inch lengths, planting in very sandy compost or coconut-fibre, only just covering them, plunging in bottom heat in a warm house, and giving very little water until signs of growth are apparent.

ZAUSCHNERIA (CALIFORNIAN FUCHSIA).—Increase this pretty flower by dividing old plants in spring, and sow seed on a gentle hot-bed in March. Insert cuttings of side-shoots in pots of sandy soil in a cold frame in September, place in a greenhouse for safety during winter, and plant out in April in well-drained positions in the rock garden.

ZEBRINA.—See Tradescantia.

ZEPHYRANTHES.—These pretty bulbs, both hardy and tender, are propagated by offsets, which in some species are very freely produced, also by seed.

ZINGIBER (GINGER).—Readily increased by dividing the rhizomes in spring.

ZINNIA.—Seed of the favourite annual *Z. elegans* should be sown on a mild hot-bed about the end of March, and the seedlings pricked out in boxes or frames when large enough, to plant out in June.

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